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the third annual report of the council on environmental quality

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ocean dumping—a national policy

the president's 1971 environmental program

toxic substances

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This report emphasizes both status of and trends in env'l quality. It discusses the interrelationships of population, technology, pollution, and other factors that will shape our future env't. Several chapters expand upon subjects covered by earlier reports. Discussed are this year's major developments at the int'l level and specific substantive issues such as the int'l trade effects of env'l controls. Coverage of developments at Federal and State levels has been extended to the local level, with a case study of local efforts to control noise. Includes an update of last year's cost figures and describes impacts of pollution control costs on 14 industries as well as on the overall economy. The report contains a comprehensive analysis of NEPA and a discussion of the National Parks.

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environmental quality

the third annual report of the council on environmental quality

August 1972

the president's message

the president's message

To the Congress of the United States:

At the dawn of the twentieth Century, almost as a voice in the wilderness he loved, President Theodore Roosevelt proclaimed an environmental ethic for America. He said:

> *I recognize the right and duty of this generation to develop and use our natural resources; but I do not recognize the right to waste them, or to rob by wasteful use, the generations that come after us.*

At the dawn of the 1970's there was still no more significant challenge facing Americans than the task of wisely conserving our natural resources and leaving the Nation a cleaner and healthier place for our children and grandchildren.

In my 1970 State of the Union Message I asked our people:

> *Shall we surrender to our surroundings or shall we make our peace with nature and begin to make reparations for the damage we have done to our air, to our land, and to our water?*

This year's report of the Council on Environmental Quality examines the environmental conditions of a dynamic and mature society. The report addresses some very complex issues—the need for indices of environmental quality and forecasting, the costs and impact on the economy of pollution control requirements, and the effects of environmental standards on international trade—and puts these issues in sharper perspective. The increasing sophistication which we are bringing to our perception of environmental problems is itself an encouraging indication of progress.

This Annual Report on Environmental Quality also offers an assessment of how we are faring. I am pleased that the data presented in the Council's report indicate that the quality of the air in many of our cities is improving. Across the nation, emissions from automobiles—a significant portion of total emissions—are declining. We can expect these welcome trends to accelerate as the new stand-

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ards and compliance schedules called for by the Clean Air Act of 1970 become fully effective.

Although the Report shows that we still have a major battle ahead to restore the quality of our waters, impressive strides have been made under present authorities. These include a fivefold increase in criminal enforcement actions under the Refuse Act of 1899 since 1968.

The private sector is performing far more effectively in environmental protection. Throughout the country, industry is developing and using new technology to reduce pollution. Surveys indicate that business has increased its spending on pollution controls by about 50 percent in each of the last two years.

The future will bring new challenges to both the private and the public sectors in arresting environmental decay. The Council's report estimates that in order to meet *current* environmental protection requirements, both the public and private sectors together will need to spend an annual amount of $33 billion in 1980. Cumulative expenditures of more than $287 billion are estimated over the 10 years from 1971 to 1980.

The encouraging news in this report by the Council—as well as the hope we have for mastering the many difficult problems that still persist—is the rapid step-by-step progress in institutionalizing and reorganzing the Federal environmental structure, the dramatic increase in funding, the wide range of administrative actions that have been taken, the strict enforcement of pollution control laws, the new international agreements which have been forged, and the broad array of major new legislation which has been submitted to the Congress for action.

years of progress

With the creation of the Council on Environmental Quality and the Environmental Protection Agency, we have brought about a major institutional reform within the Federal Government and a far more effective organization for environmental policy-making and enforcement. This reform has produced major progress—evidenced, for example, by the broad legislative proposals for environmental improvement which I have submitted to the Congress and by the vigorous enforcement of our pollution laws. The establishment of the National Oceanic and Atmospheric Administration gives us a focus on the marine environment. I have proposed a Department of Natural Resources, for coordinated resource management, and a Department of Community Development, for a systematic approach to both urban and rural growth. The Congress has yet to act on these two crucial reorganization proposals.

Under the National Environmental Policy Act (NEPA), we have undertaken a fundamental reform in the requirement that Federal agencies give careful analysis to the potential environmental impacts of proposed Federal actions. Already this changed emphasis has led to reconsideration of some projects, improvements of many others, and, overall, a far more thoughtful and comprehensive planning process. Our requirement that this whole process of environmental analysis must be open to the public for examination and comments—well before proposed actions are taken—is providing a new and more open dimension to Government. We can be proud of this record of improved citizen participation in the vital process of public decision-making.

The level of Federal funding for environmental protection has never been higher. In the four years since fiscal year 1969, Federal outlays for environmental protection have increased fourfold. Funding for clean-up of pollution at Federal facilities has increased from a $52 million annual level at the outset of my Administration to my 1973 budget of $315 million.

Regulatory and enforcement actions have accelerated dramatically over the past four years. The number of criminal actions taken by the Justice Department against water polluters was increased fivefold—from 41 to 191—between 1968 and 1971. And this Administration was the first to use Refuse Act civil injunctions against water polluters. EPA has taken action to halt harmful discharges into Lake Superior and shut down major industries during an air pollution crisis in Birmingham, Alabama.

In our long-term determination to provide tangible benefits for our children and grandchildren, we have created the Legacy of Parks program. Over 140 Federal properties have already been made available for park and recreation use, covering more than 20,000 acres in thirty-nine states and Puerto Rico. Most of these natural retreats are located in and near cities where the need for open space is greatest. The estimated fair market value of these properties is almost $100 million. In addition, we proposed major urban parks at gateways to both of our coasts—New York City and San Francisco. These two parks would comprise almost 50,000 acres, including valuable cultural, historic, and recreation assets accessible to millions of people.

My Administration has tackled a host of controversial issues of environmental protection. We have limited oil drilling in the Santa Barbara Channel off the California coast. We helped protect the Everglades in Florida by stopping a proposed jetport. In addition, I proposed legislation to acquire interests in the Big Cypress Swamp to protect the Everglades' water supply. We halted the Cross-Florida Barge Canal and are considering the inclusion of the Oklawaha River in the system of scenic and wild rivers. We have restricted use of DDT almost solely to public health purposes. We stopped the use of poisons on public lands. And we stopped all commercial whaling by the United States as well as all imports of whale products into this country. These are examples of vigorous executive action taken by my Administration to protect the environment.

new laws we need

New legislation is still badly needed in a number of areas, and in a series of environmental messages to Congress I have set forth a comprehensive legislative program designed to clean up the inherited problems of the past and to deal with emerging problems before they become critical. Many of these problem areas are defined in this Annual Report. To date, much of the proposed legislation has been the subject of congressional hearings, where it has attracted heartening interest and support. However, the record of final congressional action is entirely inadequate, with more than 20 major environmental proposals still pending.

Last month, I signed an important Port and Waterways Safety Act into law. This new law, which I proposed in May 1970, will help protect our inland waters from oil and other hazardous pollutant spills. This is a welcome beginning, but passage of my other major proposals to give us effective tools to deal with the environmental challenge—together with creation of a new Department of Natural Resources—will be essential, in my judgment, if we are to have an adequate base for improving environmental quality. I urge the Congress to complete final action on responsible legislation to give us authority to upgrade water quality and to curtail the dumping of wastes at sea. We urgently need the new controls I have proposed over the use of toxic substances such as mercury, over the increasing problem of excessive noise, and over the misuse of chemical pesticides.

I have proposed a Toxic Wastes Disposal Control Act under which the Environmental Protection Agency would establish Federal Guidelines and requirements for State programs to regulate disposal on or under the land of those toxic wastes which pose a hazard to health. The Act would provide for Federal enforcement action if a State should fail to establish its own program.

Legislation which I have proposed is urgently needed to protect the land from the potential ravages of mining, by imposing adequate standards of reclamation. Strip mining alone now disturbs almost 4,650 acres a week. My proposed Power Plant Siting Act, for which the need is more evident with each passing month, would allow us effectively to reconcile environmental protection and energy needs.

I have proposed new legislation calling upon the States to assume control over land-use planning and regulation in areas of critical environmental concern and to regulate land use around major growth-inducing facilities such as highways and airports. I have asked the Congress for authority to initiate at the State level regulatory programs to control sediment affecting water quality from earthmoving activities such as building and road construction. Federal enforcement would be imposed in situations in which a State failed to implement such a program.

I proposed a new type of law for pollution control purposes—a charge on harmful sulfur oxides emissions. This proposal embodies the principle that the price of goods should be made to include the costs of producing and disposing of them without harm to the environment. I also proposed a law that would employ our tax structure to discourage potentially harmful development in our precious coastal wetlands.

I have asked for a new and more effective Federal law to protect endangered species of wildlife—by covering species likely to become endangered as well as those more immediately threatened, and by imposing Federal penalties for taking of such species.

These proposals, and others I have put forward, are vital to all Americans in the years to come. But the critical final steps have yet to be taken. The Nation needs these laws, and they should be enacted this year. The Congress has a splendid opportunity to leave an historic record of environmental achievement, an opportunity which it must seize. The time for deliberation has passed. *It is now time for action.*

nations acting together

While our most immediate concern must be for the quality of our national environment, it is clear that we are part of a global environment whose long-range protection must be achieved by a mix of national and international efforts. This past year witnessed three historic milestones in the field of international environmental activity.

On April 15, in Ottawa, Prime Minister Trudeau and I signed the Great Lakes Water Quality Agreement providing a common commitment to work together to clean up these important, shared resources.

On May 23, in Moscow, President Podgorny and I signed a Cooperative Agreement on Environmental Protection which opens a new area of U.S.-Soviet cooperation and permits our two peoples to work together on the solution of environmental problems in eleven broad areas.

Between June 5–16, in Stockholm, the United Nations Conference on the Human Environment brought together the representatives of 113 nations representing nine-tenth's of the world's people to explore together the opportunities for national and international action on common environmental problems. The Conference achieved nearly all of the goals which the United States had urged in advance. Specifically, the nations:

—Reached agreement on the establishment of a permanent new organization within the United Nations to coordinate international environmental activities.

—Agreed to the establishment of a United Nations environmental fund to be financed by voluntary contributions from U.N. member governments. I shall ask Congress to authorize and appropriate $40 million as our Nation's share of a five-year, $100 million fund.

—Endorsed completion of a convention proposed by the United States to control ocean dumping of shore-generated waste. The favorable prospect for international action heightens the urgency of passing the domestic legislation I have proposed to curtail ocean dumping from our shores.

—Approved an "earthwatch" program for worldwide environmental monitoring.

—Endorsed in principle a convention on endangered species, designed to protect species of plants and animals threatened with extinction by imposing controls on international shipment, import and export.

—Endorsed our recommendation for a ten-year moratorium on commercial whaling. (Despite vigorous U.S. efforts, this moratorium was not agreed to by the International Whaling Commission at its recent meeting, although we were successful in achieving substantially reduced quotas and other protective measures.)

In addition, a proposal which I made in 1971 for a World Heritage Trust—to give uniquely important historic, cultural and natural areas of the world special international recognition and protection—was strongly supported at Stockholm. When established, the Trust will provide a vital new international dimension to the national park concept.

Environmental problems do not distinguish between national boundaries or differing social and economic systems. Environmental cooperation offers nations an opportunity for dealing constructively with each other and for responding to the growing aspirations of ordinary people around the globe to live decently and well in healthful surroundings.

I am hopeful about the prospects of international cooperation in the environmental field. The U.S. will continue to provide leadership in developing such cooperation. I am encouraged—even more profoundly—that the common search for a better environment can be one of those activities which serves to unify nations.

the environment and our people

In October, 1971, I initiated the Environmental Merit Awards Program. Administered by the Environmental Protection Agency in cooperation with the Office of Education, this program gives national recognition to successful student projects leading to environmental understanding or improvement. Qualifications for the awards are determined by local boards. Each board consists of secondary school students, faculty, and representatives of the local community. Already thousands of high schools and summer camps from all fifty states are registered in the program. This Fall the program will be expanded to include junior high schools as well.

As I said in my 1972 Environmental Message to Congress:

> *The starting point of environmental quality is in the hearts and minds of the people. Unless the people have a deep*

> *commitment to new values and a clear understanding of the new problems, all our laws and programs and spending will avail little. The young, quick to commit and used to learning, are gaining the changed outlook fastest of all. Their enthusiasm about the environment spreads with a healthy contagion. Their energy in its behalf can be an impressive force for good.*

As we reflect upon the characteristics and problems of the dynamic and mature society that this Annual Report of the Council on Environmental Quality describes, there should be a sober realization that we have not done as well as we must, that changes in laws and values come slowly, and that reordering our priorities is difficult and complicated. But there is ample room for encouragement in the growing capacity of a people able to assess their problems, take stock of their situation and get on with the unfinished business of shaping the United States as a model of a satisfying and healthful environment.

I welcome and salute the lead that our young people are taking in this great endeavor.

the rising sun

Long before America was powerful or wealthy, we were already looked to for leadership in demonstrating the possibilities of a vigorous, free society. By the time of the Constitutional Convention this country had captured the world's imagination and stood high in international esteem, not for its material wealth, but for its ideals.

Today as nations around the globe strive to enhance the lives of their citizens, the effort directed toward a cleaner and healthier environment is a vital measure of a country's stature.

This is a hopeful sign that the productive pursuits of peace are coming gradually to command increasing attention in the discourse and competition among nations. In the 197th year of American Independence, the quality of life enjoyed by our citizens has become a new sign to the world of our progress as a people.

I am reminded of Benjamin Franklin's remark at the Constitutional Convention in Philadelphia, when he pointed to the golden half-sun engraved on the back of General Washington's chair: "Now at length I have the happiness to know that it is a rising and not a setting sun."

Richard Nixon

THE WHITE HOUSE, *August 1972.*

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EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL ON ENVIRONMENTAL QUALITY
722 JACKSON PLACE, N. W.
WASHINGTON, D. C. 20006

August 7, 1972

LETTER OF TRANSMITTAL

THE PRESIDENT:

Sir: The Council on Environmental Quality herewith submits its third Annual Environmental Quality Report, August 1972, in accordance with Section 201 of the National Environmental Policy Act of 1969 (42 U.S.C. 4341).

Respectfully,

Russell E. Train
Russell E. Train
Chairman

Robert Cahn
Robert Cahn

Gordon J MacDonald
Gordon J. MacDonald

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preface

The Third Annual Report of the Council on Environmental Quality was prepared in accordance with the National Environmental Policy Act of 1969, Public Law 91-190, 42 U.S.C. 4321, which requires the Council to report at least once a year on the state of the environment and efforts to improve it.

The First Annual Report suggested a variety of directions for Federal, State, and local action—both legislative and administrative. Many of these recommendations have been or are being implemented or have led to proposals for legislation now before the Congress or other legislative bodies.

The Second Annual Report, instead of discussing and making recommendations on the full range of environmental problems, examined in depth two fundamental aspects of environmetal quality—economics and legal developments. It also reviewed the status of and trends in environmental quality and developments, particularly among the States, since last year. Finally, it described a number of environmental problems in the inner city.

Many of the chapters in this Report are similar in scope to those of last year. It covers Federal and State activities during the past year, the development of environmental indices and the legal implications of the National Environmental Policy Act. The chapter on international aspects of environmental quality not only covers major

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developments over the past year, such as the U.N. Conference on the Human Environment, but also deals with specific substantive areas such as the trade effects of environmental controls between trading nations. For the first time, there is a chapter on local environmental quality activities, emphasizing, as a case study, local efforts to control noise. The chapter on forecasting the future discusses the interrelationships of population, resources, agricultural productivity, technology, pollution, and other factors in shaping man's future environment. The chapter on National Parks deals with the history of the National Park System, the pressures these parks are under, and the steps being taken to deal with such pressures. The Report's last chapter summarizes and relates some of the highlights of the report and their implications for the future.

The Council welcomes comments on this Report, especially suggestions for data that could be included to show status and trends in environmental quality and activities at the State and local levels of government and in the private sector. We would also appreciate comments on the Report's presentation, including the appendices, footnote references, graphic material, and the like.

Although this Report is the product of long and concerted efforts by the Council's staff and members and reflects excellent cooperation from a number of Federal agencies, a number of individuals both inside and outside the Government deserve special gratitude and acknowledgment for their assistance. Special appreciation is due to: Shelby T. Brewer, Atomic Energy Commission; Elizabeth Cuadra, Environmental Protection Agency; Jerome K. Delson, Resources for the Future, Inc.; William Franklin, Midwest Research Institute; Ivars Gutmanis, International Research and Technology Corp.; Allan Hirsch, Environmental Protection Agency; Allan Kneese, Resources for the Future, Inc.; James Liverman and Richard A. Livingston, Atomic Energy Commission; Tom McMullen, Environmental Protection Agency (Durham, N.C.); Tom Schroth, Sedgwick, Maine; and John C. Waugh, Santa Fe, New Mexico.

the third annual report of the council on environmental quality

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1 the quest for environmental indices

Accurate and timely information on status and trends in the environment is necessary to shape sound public policy and to implement environmental quality programs efficiently. Further, the American people are entitled to know whether the public and private money being spent to protect the environment returns a commensurate improvement in environmental quality.

This chapter discusses why information on the environment is so important and what difficulties stand in the way of a truly adequate system of reporting environmental status and trends. The difficulties are generally of two types: collecting accurate and representative data and presenting or analyzing the data so as to render it both comprehensible and meaningful.

One of the most effective ways to communicate information on environmental trends to policymakers and the general public is with indices. An index is a quantitative measure which aggregates and summarizes the available data on a particular problem. There are many types and forms of indices. An index can be just a simple ratio, for example, the ratio of average ambient air pollution to a standard, or it can be a complex formulation involving a number of factors and a variety of mathematical manipulations. The nature and complexity of the index used will depend on the subject matter and the purpose the index is to serve. It is important that any index be backed up by more detailed but comprehensible components to allow more specific analysis of environmental trends.

Information on the environment can be presented to the public in a format which lies anywhere along a continuum ranging from the raw data at one extreme to a single index number for the whole environment at the other. The raw data end of the continuum is the most precise in the sense of providing the details of a particular environmental condition—but the least meaningful to policymakers and the general public. At the other extreme, a single index number representing total environmental quality might seem meaningful to the public but would involve aggregating and summarizing so much diverse data that it would likely be misleading in many important respects. Additionally, the degree of generalization involved would make such an index virtually useless to policymakers and technical people concerned with specific environmental problems.

On the other hand, the use of a limited number of environmental indices, by aggregating and summarizing available data, could illustrate major trends and highlight the existence of significant environmental conditions. It also could provide the Congress and the American people measures of the success of Federal, State, local, and private environmental protection activities. An analogy might be drawn with the economic area, where the Consumer Price Index, Wholesale Price Index, and unemployment rates provide a useful indication of economic trends and of the success of Government policies in dealing with these areas.

The development of environmental indices has been slow. Many useful environmental data, therefore, lie in bulky volumes or on computer tapes and are used only rarely. The Council, working closely with other Federal agencies, is attempting to develop meaningful indices to remedy this situation.

The importance of environmental monitoring information and the difficulties of developing indices will be discussed in the context of several aspects of environmental quality: air pollution, water pollution, pesticides, land use, wildlife, and toxic substances. During the past year we have studied intensively the quality and availability of data in each of these areas.

For air and water pollution we have presented several indices. However, it must be stressed that the indices used in this chapter are very tentative. All of them are unsatisfactory in some respects, and most of them have not been adequately tested in the field to determine their validity. They are presented to illustrate the types of environmental indices that can be developed and to stimulate further work on such indices. We believe that their publication in this report, despite their shortcomings, will stimulate discussion and analysis and thereby quicken the process of developing satisfactory indices of environmental quality.

air pollution*

Progress in developing indices for air pollution is more advanced than in any other environmental area. Much remains to be done to sharpen the accuracy and timeliness of the data, but there are several composite measures of air pollution that provide sound indicators of air quality. More than one measure is necessary because there are several distinct aspects of the air pollution problem.

The amount of pollutants emitted from particular sources is the best measure of the effectiveness of control programs. However, this measure does not indicate changes in actual air quality, because it does not take into account wind, climate, terrain, and other factors governing the dispersion of pollutants once they are emitted. Thus, both emissions and ambient air quality must be measured. Finally, it is important to measure air pollution in terms of its effects on human health, materials, and vegetation.

Based on almost all measures used, air quality on a nationwide basis improved between 1969 and 1970. While some of this apparent improvement may be due to changes in weather, localized short-term fluctuations, or other factors aside from a meaningful reduction of emissions, the trend is promising.

Table 1 shows estimated emissions of air pollutants by weight for calendar year 1970. The data are based on calculations made by Federal air pollution officials, not on actual emissions measurements. For two of the five major pollutants, emissions in 1970 were less than they were in 1969, while emissions were greater for only one pollutant. This contrasts with the 1968-69 data when emissions of four of the five pollutants increased over the previous year. The total weight of pollutants from particular sources is not shown in Table 1 because of the distortion inherent in combining the simple weights of the different pollutants.

The weight of air pollution emissions is only a rough measure of air pollution. Indeed, the geographic concentration of pollution sources and the dispersion of the pollutants once they leave the sources determine actual air quality. Also, weight does not take into account the effects of a pollutant. For example, Table 1 considers all particulates as a single category, although the environmental impact of very small particulates, which add little to total weight, differs markedly from the larger particulates. (It takes 1,000 particles, 0.5 microns in diameter, to equal the weight of 1 participle, 5 microns in diameter, of the same material. Yet 1 ton of fine particles in the air reduces visibility 25 times as much as 1 ton of larger particles. And finer particles are also more of a health hazard.[1])

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*Throughout this section the following abbreviations will be used: CO—carbon monoxide; TSP—total suspended particulates; SO_x—sulfur oxides; HC—hydrocarbons; NO_x—nitrogen oxides.

Table 1

Estimated Emissions of Air Pollutants by Weight, Nationwide, 1970 (Preliminary Data)

[In millions of tons per year]

Source	CO	Particulates	SO_x	HC	NO_x
Transportation	111.0	0.7	1.0	19.5	11.7
Fuel combustion in stationary sources	.8	6.8	26.5	.6	10.0
Industrial processes	11.4	13.1	6.0	5.5	.2
Solid waste disposal	7.2	1.4	.1	2.0	.4
Miscellaneous	16.8	3.4	.3	7.1	.4
Total	147.2	25.4	33.9	34.7	22.7
Percent change 1969–70	−4.5	−7.4	0	0	+4.5

Source: Environmental Protection Agency.

Table 2 provides some historical perspective on total emissions. It shows that over the past 30 years all of the major pollutants, except particulate matter, have increased significantly. Given the major increases in population and industrialization which have marked this period and the short time in which serious control efforts have been undertaken, this finding is not surprising.

Table 2

Weight of Emissions of Air Pollutants, 1940–1970 (Tons $\times 10^6$)

Year	SO_x	CO	Particulates	HC	NO_x
1940	22	85	27	19	7
1950	24	103	26	26	10
1960	23	128	25	32	14
1968	31	150	26	35	21
1969	34	154	27	35	22
1970	34	147	25	35	23

Source: EPA, "Nationwide Air Pollutant Emission Trends, 1940–70." 1972, forthcoming.

Figure 1 pictures the long-term trends for the *ambient* air levels of three major pollutants—CO, SO_2, and TSP. This type of trend analysis is quite useful, but like the analysis of pollution tonnage, it does not indicate the comparative damage different pollutants can cause. One of the advantages of an index is that, through weighting, the comparative importance of the different elements included in the index can be taken into account. An air pollution index, for example, would weight a ton of sulfur oxides much more heavily than a ton of carbon monoxide, because a ton of sulfur dioxide is more damaging to health.

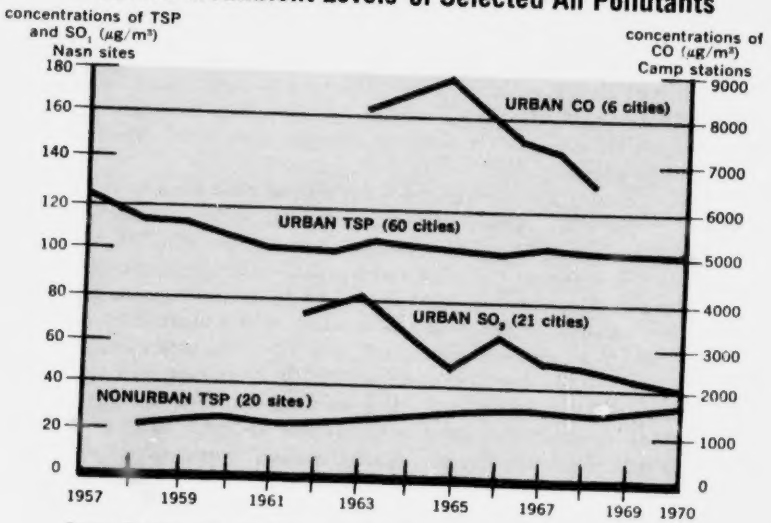
Considerable knowledge about the effects of a pollutant is necessary to weight the elements in an index accurately. In most environmental areas, further research is necessary to add to our knowledge about effects. For example, the ambient air quality standards, on which most of the air pollution indices are based, are still somewhat controversial, and research is underway to understand more fully the long-term health effects of air pollutants, so that the scientific basis for the standards can be improved.

Several indices have been developed to show trends in actual air quality. Two indices—the Mitre Air Quality Index (MAQI) and the Extreme Value Index (EVI)—have been developed for the Council by the Mitre Corp. Another index, the Oak Ridge Air Quality Index (ORAQI), has been developed by the Oak Ridge National Laboratory. The ORAQI is computed quite differently from the Mitre index and for that reason has been included in some of the tables for comparative purposes.[2]

The Mitre Air Quality Index combines indices for individual pollutants for each site. Each pollutant index relates measured levels of pollution to the national secondary air quality standards promulgated by the Environmental Protection Agency.[3] These standards, which go beyond the primary or health protection standards to

Figure 1

Trends in Ambient Levels of Selected Air Pollutants



Source: The Mitre Corp. MTR-6013. Based on Environmental Protection Agency data protect vegetation, materials, and aesthetics, refer to annual averages and extreme values not to be exceeded more than once per year.[4] Using the ratio of pollution levels to the standard permits a comparison of different pollutants which may have very different effects. For any pollutant, an index value greater than one means that the standard has been exceeded. A value less than one indicates that the standard has not been exceeded. Thus if the combined index for all pollutants is less than one, all standards are being met.[5]

While the MAQI shows how the pollutant concentrations relate to both long- and short-term standards, the Extreme Value Index measures the extent of very high-level pollution for short periods of time. The pollution conditions measured by EVI are those which are most directly related to personal comfort and well-being. Like the MAQI, the EVI is first computed for each individual pollutant and then aggregated for all pollutants at a given site. This index consists of an accumulation of measured values which exceed a given extreme standard divided by the standard. The extreme standards are the EPA secondary standards for short-term (1-to-24-hour) concentrations.[6]

The ORAQI, like the MAQI, is based on the EPA secondary standards. It puts less emphasis on violation of the standards than do the MAQI and EVI. However, it is mathematically adjusted so that a value of 10 represents essentially unpolluted air and a value of 100 represents all pollutant concentrations reaching the federally established standards.[7]

Data were available to compute the MAQI and EVI for three of the five pollutants for which national standards have been established—sulfur dioxide, nitrogen dioxide, and total suspended particulates—but not for carbon monoxide and photochemical oxidants. Tables 3 and 4 show the 1968, 1969, and 1970 values for MAQI and EVI in communities with different population sizes. Because the data come from the National Air Sampling Network, which covers only one site for each community, they often differ from local monitoring data.

As Tables 3 and 4 show, the worst air pollution conditions are in the largest cities, which is hardly surprising. What is surprising is that, according to the indices, communities under 100,000 population suffer problems almost as severe as those in the large cities. Somewhat anomalous findings like this may be due as much to the sample of communities chosen or to the location of the monitoring site as they are to actual air quality conditions. The cities under 100,000 in the sample used were generally selected because they had air pollution problems, and thus the true meaning of the data is probably that dirty, small cities have problems just as severe as large cities.

Communities of all sizes showed marked improvement on the MAQI and EVI scales between 1968 and 1970. However, as shown in Table 5, this improvement still was not enough for most communities to meet the EPA secondary standards.

Table 3

MAQI Values, 1968–70, by Population Class

Population class of community	1968 MAQI	1969 MAQI	Percent improvement, 1968–69	1970 MAQI	Percent improvement, 1969–70
Under 100,000 (18 sites)	3.34	3.00	10.2	2.71	9.65
100,000 to 400,000 (38 sites)	3.04	2.56	15.8	2.51	1.95
Over 400,000 (26 sites)	4.03	3.48	12.8	3.06	12.1
National sample (82 sites)	3.77	3.24	14.1	2.91	10.2

Source: Mitre Corp., "National Environmental Indices: Air Quality and Outdoor Recreation" (MTR 6159), April 1972.

Table 4

EVI Values, 1968–70, by Population Class

Population class of community	1968 EVI	1969 EVI	Percent improvement, 1968–69	1970 EVI	Percent improvement, 1969–70
Under 100,000 (18 sites)	10.35	7.68	25.8	6.41	16.6
100,000 to 400,000 (38 sites)	6.61	4.10	38.0	3.34	18.5
Over 400,000 (26 sites)	11.56	7.99	30.7	6.66	16.7
National sample (82 sites)	10.32	7.03	31.9	5.84	16.9

Source: Mitre Corp., "National Environmental Indices: Air Quality and Outdoor Recreation" (MTR 6159), April 1972.

Table 5

Cities in Excess of Secondary Standards for 82 Selected NASN Sites

YEAR	SO_2		NO_2		TSP	
	Number	Percent	Number	Percent	Number	Percent
1968	19	23.2	79	96.3	76	92.7
1969	13	15.9	67	81.7	79	96.3
1970	8	9.8	66	80.5	78	95.1

Source: Mitre Corp., "National Environmental Indices: Air Quality and Outdoor Recreation" (MTR 6159), April 1972.

Table 6 traces the trends in several major cities. (Data for additional cities are in Appendix 5 of this chapter.) Most of the cities have followed the general pattern of improved air quality, indicated by the MAQI, EVI, or ORAQI values. The table also compares the primary national ambient air quality standards to the annual average of each of the three pollutants covered by the indices. It must be stressed, however, that all of the data in Tables 5 and 6 are based on only one sampling station in each city, which may considerably distort the results. For example, it is likely that if more complete data were available, they would show that some portion of the cities shown meeting the SO_2 standards in Table 5 had exceeded those standards.

The potential health hazard from air pollution can be simply measured by estimating the number of people exposed to air pollution that exceeds the EPA primary (health protection) standards. EPA has made such an estimate for a sample of the U.S. population, using 1964–66 monitoring data.[8] While 43 percent of the sample population lived in areas where the monitoring data indicated that the sulfur dioxide primary standards were exceeded, the level of photochemical oxidants exceeded the standard in all the areas sampled. These are very rough estimates based on old data. Because

Table 6

Air Pollution Data for Selected Cities

				Ratio of annual mean to EPA primary standards		
YEAR	MAQI	EVI	ORAQI	SO_2	TSP	NO_x
			ATLANTA			
1968	2.88	2.21	108	0.39	1.07	2.20
1969	2.51	1.10	91	.33	1.03	1.80
1970	2.60	3.44	86	.24	1.20	1.65
			DETROIT			
1968	4.01	17.90	145	0.83	1.79	2.44
1969	3.68	12.11	138	.69	1.55	2.25
1970	3.39	9.17	102	.46	1.51	1.69
			ST. LOUIS			
1968	3.82	18.07	157	1.14	2.16	2.17
1969	5.35	27.24	163	.91	2.45	2.02
1970	4.41	13.15	125	.73	2.05	1.72
			MILWAUKEE			
1968	4.27	20.82	119	0.48	1.85	2.05
1969	3.17	10.17	89	.20	1.47	1.69
1970	2.69	6.41	70	.19	1.21	1.21

Sources: Mitre Corp., "National Environmental Indices: Air Quality and Outdoor Recreation" (MTR 6159), April 1972. Communication from Oak Ridge National Laboratory. Communication from EPA, National Environmental Research Center. Division of Atmospheric Surveillance.

of the importance of the potential health effects of air pollution, information of this kind should be collected and made available on a regular and timely basis.

All of the data in this discussion suffer from the problems of too few monitoring sites whose locations are determined by imprecise criteria. Unreliable instrumentation and inadequate frequency of measurement also are problems. It will take a long time to remedy these defects. But at least for air pollution, unlike many other aspects of the environment, we know fairly specifically what data should be collected and what kind of indices will best picture its status and trends. The air pollution indices are useful to the public and the policymaker alike, to help them judge how serious the problem is, whether control programs are succeeding, and what aspects of the problem are getting better or worse.

water pollution

The approach to developing a water pollution index is similar to that of an air pollution index, except that the number of water pollutants usually measured is larger and there are no uniform national standards of water quality. Also, water is used for many more purposes than air. The range of possible chemical and biological reactions that take place in water, viewed in the context of the many possible alternative uses of water, makes measuring water quality an extremely complex task.

EPA has developed the "PDI index" (prevalence-duration-intensity index), which allows any water body to be described in terms of the prevalence, duration, and intensity of its water pollution, corrected for natural background pollutant levels. The index is based on how much water quality deviates from Federal-State water quality standards, which vary from place to place, depending on locally established designations as to what the water should be used for (drinking, swimming, industrial waste discharge, etc.).

The prevalence of water pollution was first assessed in 1970 and reported in last year's Annual Report. The 1970 figures indicated that 27 percent of the U.S. stream and shoreline miles were polluted. EPA assessed it again a year later and found that, despite improved field reporting, the prevalence of pollution was about the same nationally (29 percent) in 1971.[9]

Table 7 summarizes the EPA data for major drainage basins. Unfortunately, of the four apparently significant shifts in reported water pollution that took place—in the Ohio, Gulf, Missouri, and Northeastern Basins—three are so obscured by variations in procedure that it is impossible to evaluate the degree of real change. Both the Gulf and Missouri Basins reported an enormous improvement in compliance with State water quality standards, but the apparent improvement between 1970 and 1971 is almost certainly due to more accurate reporting, not to better water. In the case of the Ohio

Table 7

Water Pollution Index Summarized for Major Drainage Areas, 1970 and 1971

Major watershed	Stream miles	Polluted miles			1971 duration-intensity factor
		1970	1971	Change	
Ohio	28,992	9,869	24,031	+13,746	0.42
Southeast	11,726	3,109	4,490	+1,381	.74
Great Lakes	21,374	6,580	8,771	+2,191	.45
Northeast	32,431	11,895	5,823	−6,072	.61
Middle Atlantic	31,914	4,620	5,627	+869	.47
California	28,277	5,359	8,429	+2,499	.27
Gulf	64,719	16,605	11,604	−5,001	.35
Missouri	10,448	4,259	1,839	−2,420	.31
Columbia	30,443	7,443	5,685	−1,758	.12
United States	**260,324**	**69,739**	**76,299**	**+5,435**	**.41**
United States less Ohio	**231,332**	**59,870**	**52,268**	**−8,311**	**.40**
United States less Columbia	**229,881**	**62,296**	**70,614**	**+7,193**	**.43**

Source: Environmental Protection Agency, "The Cost of Clean Water" (1972).

River Basin, the 1970 assessment overlooked a large number of smaller tributaries which were polluted.[10]

The last column of Table 7 shows the duration-intensity factor for the 1971 figures. Whereas the prior columns simply indicate what portion of the stream was polluted, the duration-intensity factor indicates how badly polluted it was and for how long during the year it was in violation of the standards. For the complete PDI index, the number of polluted stream miles would be multiplied by the duration-intensity factor. Thus the higher the factor is, the worse the pollution.

The EPA PDI index has several advantages. It covers all U.S. surface waters. It considers the relationship of actual water quality to State standards of desirable water quality. And it allows for judgment as to the effects of the water pollution in any particular stream. It has proved a useful management tool, for planning, for directing resources to the most polluted areas and for suggesting improvements in monitoring coverage.

However, the index also has major disadvantages. Most important, its estimates of water quality conditions are based primarily upon judgmental evaluation by regional EPA personnel, although data are used from the approximately 10,000 stations that collect water quality data. Thus, although the data from the stations are examined by EPA personnel, they are not used in a systematic manner which could be replicated. Second, the index does not identify the type of pollutant responsible for the pollution, e.g., BOD, suspended solids, or nutrients. EPA plans to add this information the next time the

PDI is repeated. Finally, the index is not sensitive enough to detect trends except after several years.

While judgmental factors inherent in the PDI index help to adjust for the numerous inadequacies of the actual water quality monitoring data, CEQ considered it desirable to explore a different approach to gauging water quality trends, based more heavily on readings from the water quality sampling stations. The Council thus contracted with a consulting firm, Enviro Control, Inc., to develop trend information based on the monitoring data collected by EPA, the U.S. Geological Survey, and other Federal and State agencies.[11]

A sample of 140 Federal and State water quality stations across the country was picked on the basis of how long the station had been collecting data and how adequate the data were (see Figure 2). Streams of all sizes were included as well as a number of estuarine, reservoir and Great Lakes locations. The stations represent a variety of types of areas, ranging from highly urbanized and industrialized to completely undeveloped. However, because of the limited number of stations from which the sample could be selected, it does not represent a complete and properly weighted cross section of all U.S. waters.

The water quality data were compared to data on the flow of the water body. Unlike air pollution data, which cannot be corrected easily for the complex effects of weather, it is known that flow rates in streams and rivers directly affect water quality, and even crude corrections for flow considerably improve our understanding of pollution levels. Use of the flow data also permitted the streams to be classified according to whether increased flow (more water in the stream) was associated with greater or less pollution (runoff or dilution trends, respectively, in the tables). The results of this analysis are shown in Tables 8 and 9.

The Enviro Control data show a mixed picture of trends in water quality. The problem of nutrients (phosphorus and nitrogen) is worsening dramatically in all types of basins, probably because of increased use of fertilizer. Oxygen-demanding wastes are increasing somewhat, mostly in high-population, high-industry basins. (Oxygen-demanding wastes require oxygen for their decomposition. This lowers dissolved oxygen (DO) levels in the water, and low DO levels change fish populations and at very low levels result in odors and the elimination of most fish life.) Surprisingly, the data show little correlation between trends in the amount of oxygen-demanding wastes and trends in the daytime dissolved oxygen in the water. This seeming inconsistency may be because of where the monitoring stations are located, the time of day the water is sampled, and such intervening factors as oxygen production by algae. The complexity of the oxygen relationships in waterways makes it quite difficult to comprehensively trace changes in the oxygen content of the water.

Salinity (the saltiness of the water) shows mostly no trend or slight improvement. The problem of suspended solids (primarily soil particles in the water) seems to be getting better.

Table 8

Pollutant Source Type and Trends for all Stations in Sample—Percent of Stations in Each Class

Pollutant type [1]	Time trend, 1965–70		
	Better	No trend	Worse
Dissolved oxygen (±10 percent)	17	63	20
Number of stations	(18)	(65)	(20)
Oxygen-demanding load (±25 percent; BOD, ±20 percent COD, TOC)	34	41	25
Number of stations	(33)	(39)	(24)
Nutrients—total phosphorus, organic nitrogen, and ammonia (±30 percent)	11	30	59
Number of stations	(7)	(19)	(38)
Nutrients—soluble phosphates (±30 percent)	19	65	16
Number of stations	(6)	(21)	(5)
Nutrients—nitrite and nitrate (±30 percent)	21	32	47
Number of stations	(13)	(20)	(30)
Salinity—total dissolved solids (±15 percent)	11	77	12
Number of stations	(9)	(61)	(9)
Suspended solids and turbidity (±40 percent)	30	62	8
Number of stations	(32)	(66)	(8)

[1] Thresholds used for determining existence of trends are given in parentheses after pollutant type. The thresholds are based on observed variability about curves of concentration versus flow.

Source: Enviro Control, Inc.

Table 9

Pollutant Source Type and Trends for Drainage Basins With Low Agriculture and High Population or High Industry, or Both High—Percent of Stations in Each Class

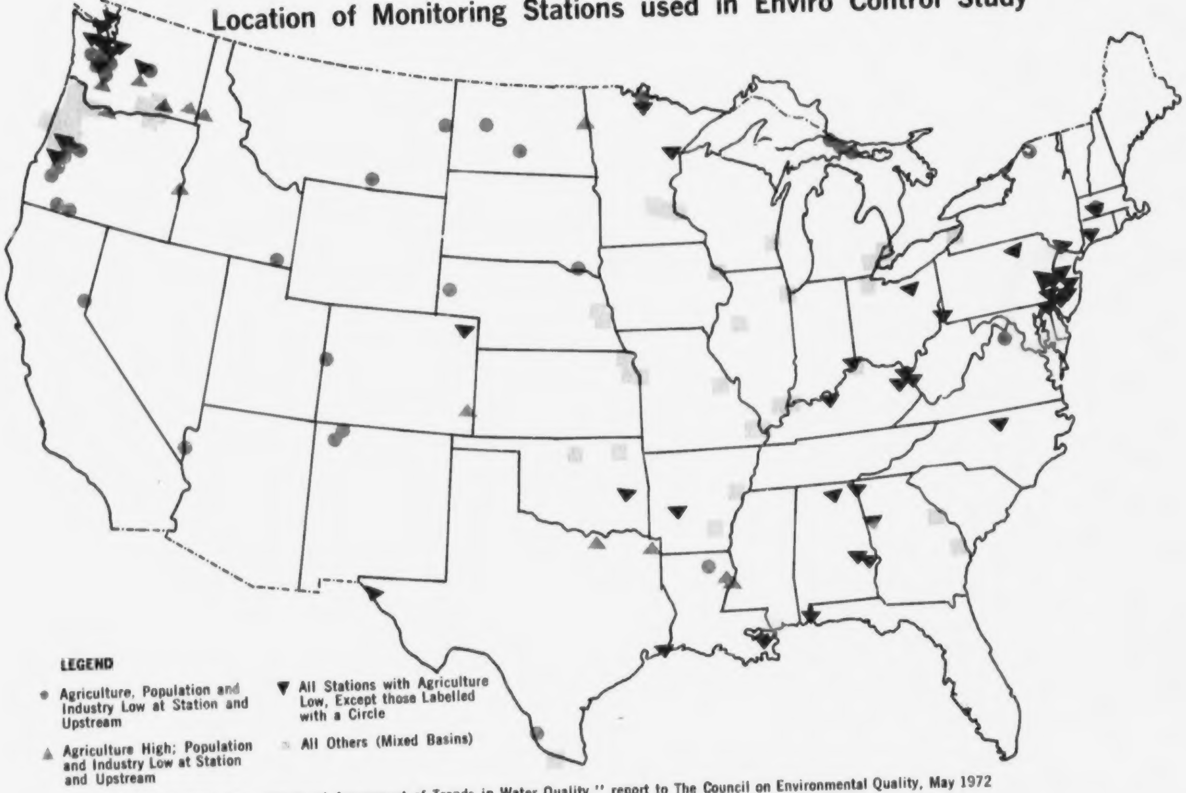
Pollutant type [1]	Dominant flow effect			Time trend, 1965–70		
	Dilution	Mixed	Runoff	Better	No trend	Worse
Dissolved oxygen (±10 percent)	4	76	20	11	75	14
Number of stations	(1)	(19)	(5)	(4)	(27)	(5)
Oxygen-demanding load (±25 percent BOD, ±20 percent COD, TOC)	11	58	31	48	29	23
Number of stations	(2)	(11)	(6)	(15)	(9)	(7)
Nutrients—total phosphorus, organic nitrogen and ammonia (±30 percent	0	80	20	18	18	64
Number of stations	(0)	(12)	(3)	(4)	(4)	(14)
Nutrients—soluble phosphates (±30 percent)	17	83	0	0	64	36
Number of stations	(1)	(5)	(0)	(0)	(7)	(4)
Nutrients—nitrite and nitrate (±30 percent)	7	86	7	5	30	65
Number of stations	(1)	(12)	(1)	(1)	(6)	(13)
Salinity—total dissolved solids (±15 percent)	46	54	0	9	67	24
Number of stations	(7)	(8)	(0)	(2)	(14)	(5)
Suspended solids and turbidity (±40 percent)	0	65	35	21	76	3
Number of stations	(0)	(15)	(8)	(7)	(26)	(1)

[1] Thresholds used for determining existence of trends are given in parentheses after pollutant type. The thresholds are based on observed variability about curves of concentration versus flow.

Source: Enviro Control, Inc.

Figure 2

Location of Monitoring Stations used in Enviro Control Study


LEGEND
● Agriculture, Population and Industry Low at Station and Upstream
▲ Agriculture High; Population and Industry Low at Station and Upstream
▼ All Stations with Agriculture Low, Except those Labelled with a Circle
■ All Others (Mixed Basins)

Source: Enviro Control, Inc., "National Assessment of Trends in Water Quality," report to The Council on Environmental Quality, May 1972

The most startling conclusion suggested by the data relates to the effect of flow on pollution in the stream. The common notion is that increased streamflow (from rain or melting snow) dilutes pollution and helps restore natural balances—unless the rain happens to wash through area sources of pollution (such as fields sprayed with pesticides) as it drains to the river. The Enviro Control data confirm that in undeveloped or agricultural areas, where most of the pollution comes from runoff (the washing of soil, fertilizers, pesticides, etc. into the water from fields and open land), rain or melting snow increases the amount of runoff and thus pollution increases with flow.

But they also show, contrary to the common notion, that in areas of high population and/or industry, only 20–30 percent of the sampled basins show a flow dilution effect. In other words, point sources of organic and nutrient pollution, such as industrial and municipal discharges, appear to be overshadowed, in most of the stations that were analyzed, by runoff sources, such as farms, feedlots, and possibly urban runoff. However, the runoff trends which the data show also may be caused by other factors, such as scouring of pollutants from riverbeds by high flow.

The Enviro data reinforce some recent steps to place more emphasis on runoff sources. What they say, in essence, is that even if all discharges of municipal and industrial pollution were stopped, many streams would still be polluted as a result of discharges from runoff sources. However, this definitely does not imply that municipal and industrial pollution is unimportant. Not only do these sources dump a large share of the pollutants in the Nation's waters, but they also account for most of the toxic metals and chemicals (except pesticides) which enter there.

Both the PDI and the Enviro data give some guidance for designing water quality monitoring networks. They also illustrate vividly the need for better data and improved analysis of water pollution problems. Work is continuing in EPA, the Department of the Interior, and elsewhere to improve the collection and analysis of water quality data. The National Sanitation Foundation has done some encouraging work on an overall Water Quality Index.[12] Our understanding of what the major sources of water pollution are, how they contribute to the problem, and how we measure trends in water quality, however, is inadequate.

If our enforcement programs and our financial investments in control are to have the maximum effect, we must greatly expand our knowledge of the causes, sources, and trends in water pollution. For example, if the Enviro analysis is confirmed by further work, it points up the need to place much greater emphasis on nonpoint sources of pollution.

pesticides

Pesticide contamination is not limited to any one medium. Excess amounts of pesticides can contaminate air, water, soil, or food. One of the best ways to analyze multimedia environmental problems is to develop a "materials balance" analysis, which traces a particular substance as it passes through various parts of the environment. A materials balance of pesticides would indicate the amounts of pesticides introduced into the environment; the paths they traveled and the chemical changes which occurred from introduction to final fate; and how much ended up in birds, fish, humans, or elsewhere in the environment.

The materials balance approach has several advantages. Because it traces the environmental pathways of a substance, it can isolate the most important points at which to act against environmental contamination. By knowing the amounts likely to occur in different media, it can anticipate the effectiveness of any particular control measure. And by showing how much of the substance to which humans and wildlife will be exposed, it can help estimate how serious the problem is.

With the aid of Stanford Research Institute, the Council investigated what data were available on various aspects of pesticides. One of the key questions was whether it would be possible to develop a materials balance analysis of pesticide flow through the environment.

Such an analysis would start with the domestic production of pesticides. Data on domestic pesticide production and supply are reported annually by the U.S. Tariff Commission and the Bureau of the Census. Domestic supply (production plus imports minus exports) in 1970 amounted to 658 million pounds, compared with 695 million pounds in 1969 and 228 million pounds in 1950. This did not include elemental sulfur used in agriculture and other chemicals used only in small part as pesticides (see Figure 3). It is not clear whether the drop over the last year is significant.

Despite the wide variety of chemicals used as pesticides, production figures for individual compounds are publicly available for less than 10 percent of the total.[13] However, Figure 4 shows the total amount of the major classes of pesticides produced—insecticides, herbicides, and fungicides. Herbicides production increased rapidly over the past 10 years. Insecticide production has also increased although less rapidly, and fungicide production has diminished somewhat.

A significant trend, which does not show up in Figures 3 and 4, is the decline in production and domestic supply of the more persistent chlorinated hydrocarbon insecticides and the substitution of less perisistent but more toxic chemicals. Domestic supply of the chlorinated hydrocarbons has dropped from a high in 1956 of 244 million pounds to 31 million pounds in 1970. During the same time period, production of parathions, a group of the organophosphate chemicals used to replace the chlorinated hydrocarbons, increased from 7 million pounds to 57 million pounds.[14]

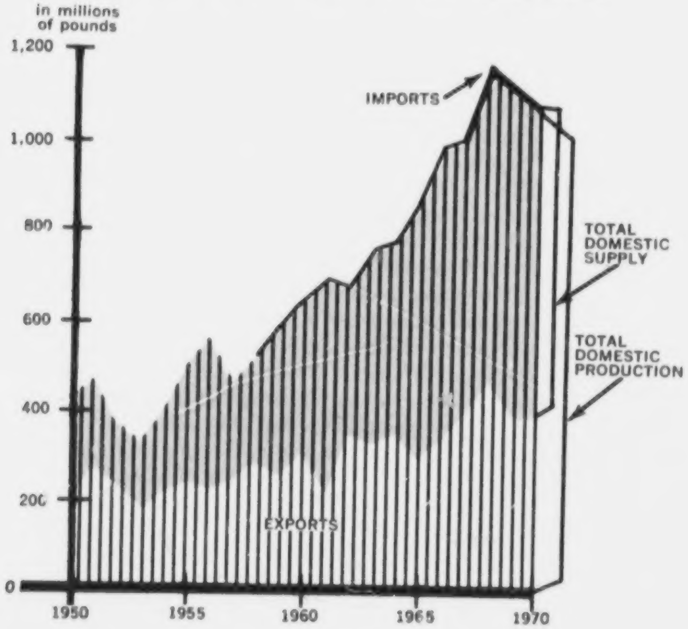
There are few data on the specific manner in which pesticides are used. The largest pesticide market, by far, is in the agricultural sector of the economy. But even the various uses in this sector are not well documented. The Economics Research Service of the U.S. Department of Agriculture surveyed 10,000 farms in the 1964 and 1966 growing seasons, and a survey of the 1971 season is currently being analyzed.[15]

Despite the difficulty of extrapolating from such a sample, a few implications can be drawn. First, agricultural pesticides use is not evenly distributed. Two crops, cotton and corn, accounted for about two-thirds of the total insecticides used. The bulk of the remaining insecticides and most of the fungicides were sprayed on fruit and vegetables. Forty-one percent of all agricultural herbicides were applied to corn.

Data from the 1966 survey further indicated that of the 891 million U.S. acres under agriculture (including pasture lands), only 5 percent was treated with insecticides, 12 percent with herbicides, and 0.5 percent with fungicides. And though cotton accounted for 47 percent of the total agricultural use of insecticides, an estimated 46 percent of the total cotton acreage received no insecticides.[16]

Figure 3

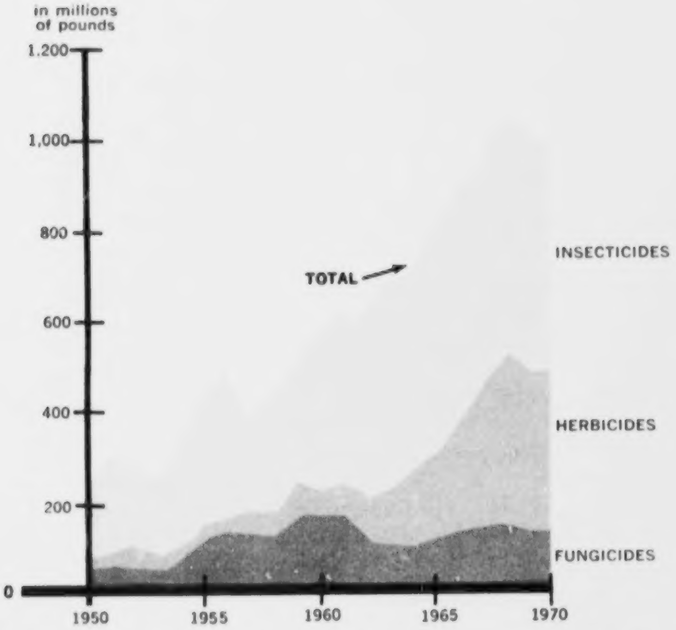
Domestic Supply of Insecticides, Herbicides, and Fungicides



Source: Stanford Research Institute, "Environmental Indicators for Pesticides," Prepared for the Council on Environmental Quality, April 1972

Figure 4

U.S. Production of Synthetic Organic Insecticides, Herbicides, and Fungicides



Source: Stanford Research Institute, "Environmental Indicators for Pesticides," Prepared for the Council on Environmental Quality, April 1972

These data reflect wide regional variations in the types and prevalence of pests and in pest control practices.

There has been considerable information collected about environmental levels of a few pesticides in the air, soil, water, food, wildlife, and man. Despite the quantity of this information, much of it has not been collected systematically, and the data are not adequate to present a total picture of the flow of pesticides through the environment.

Data on other aspects of the pesticide problem are even more scanty. For example, the only regular sources of information on pesticide poisonings and deaths are the Food and Drug Administration Poison Control Centers. However, these centers cover only 8 percent of the hospitals in the United States, so the data grossly underestimate the actual number of cases. A 1969 survey in Iowa, by the University of Iowa, uncovered over 700 cases of pesticide exposures requiring medical attention. But only 88 of them were reported to the poison control centers.[17]

Not only are the data on pesticides inadequate, but there are also conceptual problems in organizing and presenting the data. Pesticides, unlike most air and water pollutants, are deliberately introduced into the environment for a beneficial purpose. Thus the mere presence of pesticides cannot be considered harmful to environmental quality, although it is clear that pesticides can cause environmental damage. This aspect of pesticide use will make the development of overall pesticide indices very difficult.

The materials balance approach is a promising way to partially surmount these difficulties. But in order to perform such analysis the quality and availability of pesticides data will have to be improved. More systematic and comprehensive data on pesticides supply and application as well as resulting levels in water, air, wildlife, and humans should be regularly collected and analyzed in a unified fashion. Until they are, a picture of the total flow of pesticides through the environment cannot be constructed.

toxic substances

Accuracy, completeness, and timeliness of data are prerequisites to adequate environmental indices. There is almost no aspect of the environment for which the monitoring data satisfy these criteria. Even in such basic areas as air and water pollution, many of the data are of questionable validity or are incomplete. In some areas the data are sparse or nonexistent. A good example is toxic substances.

One of the obstacles to adequate data collection on toxic substances is the absence of any Federal program for systematically regulating and collecting data. This gap would be filled by passage of the Administration's Toxic Substances Control Act, which passed the Senate on May 30 but which has yet to be acted upon by the House.

Another obstacle is that much of the information related to toxic substances is proprietary information which the manufacturers will not make public. For example, most manufacturers consider the amount of a particular substance that they produce to be a trade secret. This makes it very difficult to do a materials balance analysis of the flow of the substance through the environment, because the amount of the substance that is produced cannot be determined.

Figure 5 shows an example of a materials balance analysis for cadmium. It traces the major sources, uses, and paths through the environment. Through such an analysis the major sources of environmental pollution from cadmium can be pinpointed. Cadmium is of particular concern because, as reported in a study by Oak Ridge National Laboratory, the estimated daily average U.S. intake of cadmium is between 0.02 and 0.1 parts per million, and there is some evidence that reduction of lifespan may occur with continuous exposure to 0.1 parts per million. Kidney damage may occur with a 50-year exposure to 0.08 parts per million.[18]

The lack of data on toxic substances also means that maximum use must be made of information from incidents involving toxic substances. Such an incident occured in Iraq early in 1972. Seed treated with a mercurial fungicide arrived too late for planting and was consumed directly by large numbers of people. Although the data are limited, the number of deaths may exceed 500, with as many as 7,000 suffering some type of injury. If these very preliminary estimates turn out to be true, Iraq's mercury poisoning incident must rank as one of the worst environmental health disasters in history. Hopefully, information drawn from this incident will help prevent future disasters.

Improved methods for sounding an early warning about potentially dangerous chemicals and metals and for setting priorities for research on toxic substances are badly needed. More adequate monitoring data and the use of methods such as the materials balance approach can play a vital part in filling these needs.

land use

The amount of land used for particular purposes at any given time tells us little or nothing about the environment. Thus the conceptual problem of what land use factors are significant for environmental quality is a difficult one. Changes in land use over time can sometimes be revealing, but most often we cannot judge without having much more information. For example, we cannot tell whether the conversion of farmland to forest is an indicator of improving or deteriorating environmental quality.

Another problem posed by measures of land use is the appropriate geographical scale at which to collect data. Most changes in land use have their primary environmental impact on the regional or local level. National data on land use are not very informative, as Figure 6, compiled by the Department of Agriculture, shows. The figures show little change over the past 70 years in the proportion of the Nation's land devoted to the four broad categories of use—cropland; grassland, pasture, and range; forest and woodland; and urban areas, transportation, and parks. In 1969, the 2,266 million acres of land in the United States (including Alaska and Hawaii) were used as follows: 430 million acres for cropland; 645 million acres for grassland, pasture, and range; 725 million acres for forest; 186 million acres for urban development, roads, and other special uses; and the remaining 280 million acres was desert, swamp, and other types of land not usable for the other categories.[19]

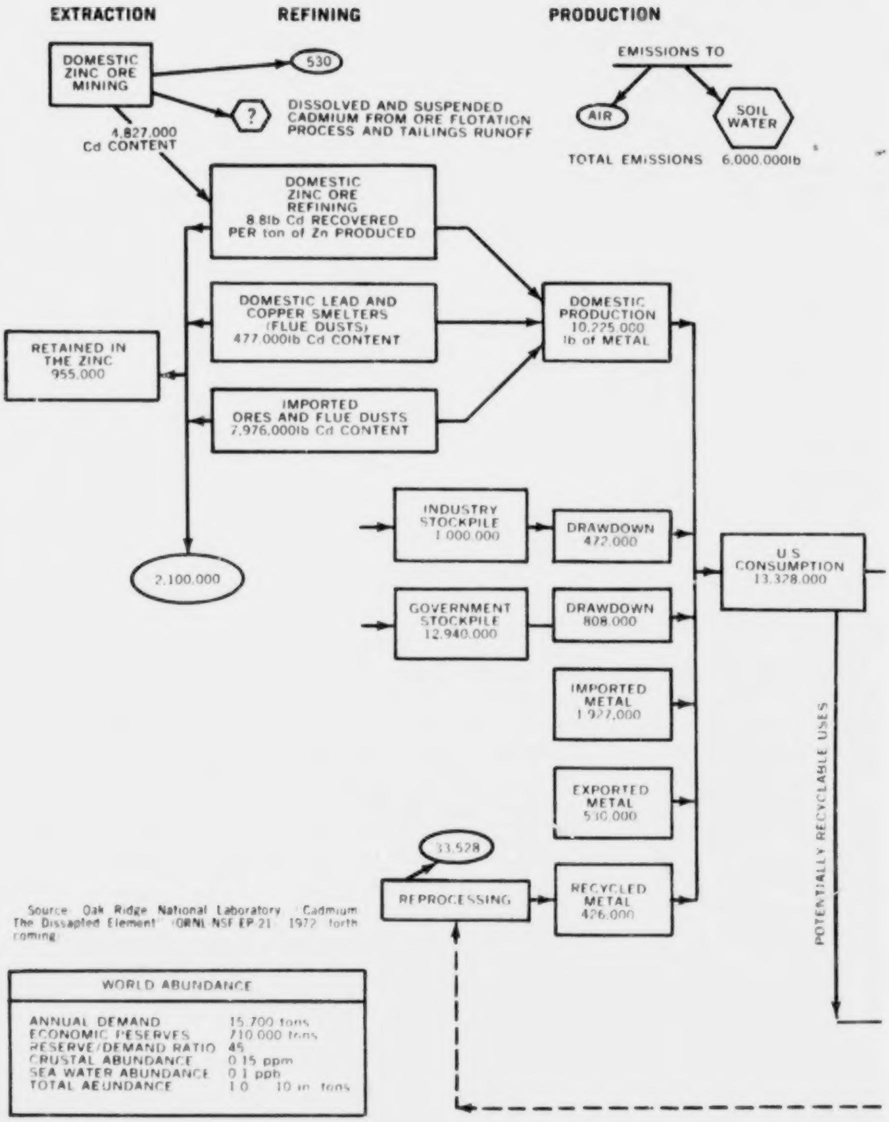
On a national basis there has been little overall change in land use. But the national data obscure marked changes which have occurred within particular States and regions. Many areas have undergone rapid urbanization, there have been marked shifts from forest to farmland in areas such as the Southern Mississippi Valley, and in many parts of the East, farmland has been abandoned and has reverted to scrub forest.

The Council not only examined overall land use but, with the

Figure 5

Flowsheet of Societal Flow of Cadmium in the U.S. 1968

U.S. MATERIAL BALANCE 1968—QUANTITIES IN POUNDS OF METAL


EXTRACTION
REFINING
PRODUCTION
DOMESTIC ZINC ORE MINING
530
?
DISSOLVED AND SUSPENDED CADMIUM FROM ORE FLOTATION PROCESS AND TAILINGS RUNOFF
4,827,000 Cd CONTENT
EMISSIONS TO
AIR
SOIL WATER
TOTAL EMISSIONS 6,000,000lb
DOMESTIC ZINC ORE REFINING 8.8lb Cd RECOVERED PER ton of Zn PRODUCED
DOMESTIC LEAD AND COPPER SMELTERS (FLUE DUSTS) 477,000lb Cd CONTENT
IMPORTED ORES AND FLUE DUSTS 7,976,000lb Cd CONTENT
RETAINED IN THE ZINC 955,000
DOMESTIC PRODUCTION 10,225,000 lb of METAL
2,100,000
INDUSTRY STOCKPILE 1,000,000
DRAWDOWN 472,000
GOVERNMENT STOCKPILE 12,940,000
DRAWDOWN 808,000
U S CONSUMPTION 13,328,000
IMPORTED METAL 1,927,000
EXPORTED METAL 530,000
33,528
REPROCESSING
RECYCLED METAL 426,000
POTENTIALLY RECYCLABLE USES

Source Oak Ridge National Laboratory "Cadmium The Dissapled Element" (ORNL-NSF-EP-21) 1972 forthcoming)

WORLD ABUNDANCE	
ANNUAL DEMAND	15,700 tons
ECONOMIC RESERVES	710,000 tons
RESERVE/DEMAND RATIO	45
CRUSTAL ABUNDANCE	0.15 ppm
SEA WATER ABUNDANCE	0.1 ppb
TOTAL ABUNDANCE	1.0 10 in tons

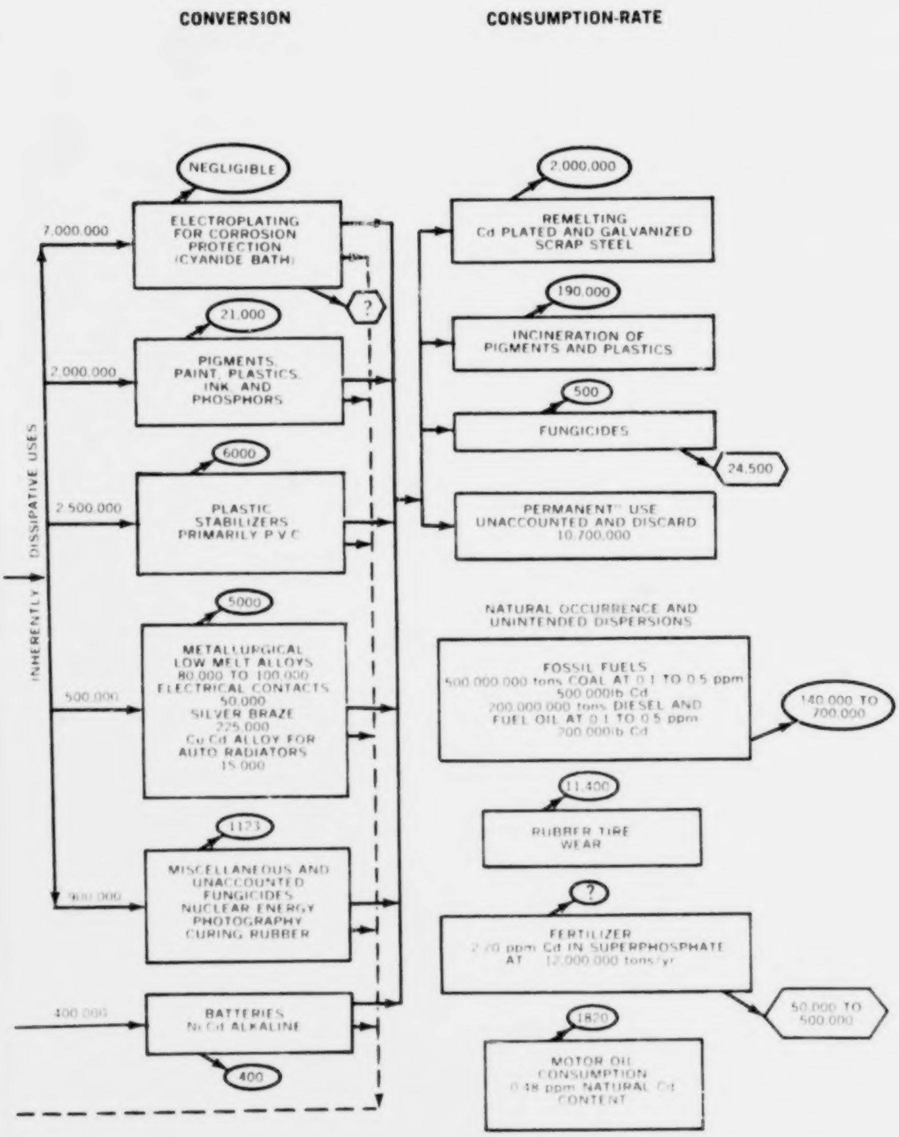
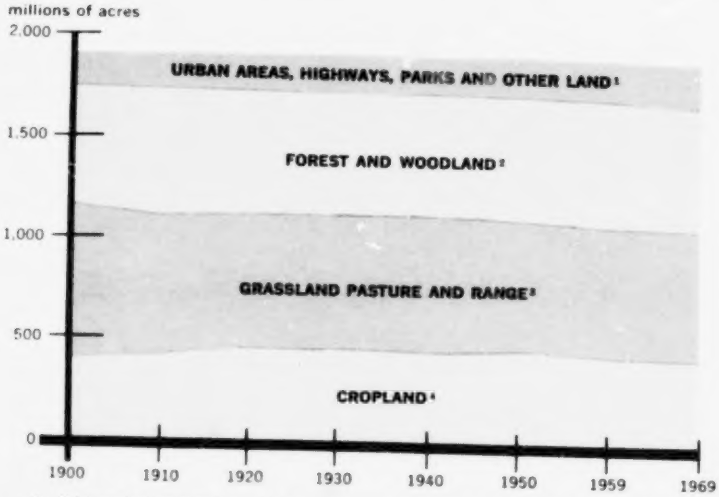

CONVERSION
CONSUMPTION-RATE
INHERENTLY DISSIPATIVE USES
7,000,000
NEGLIGIBLE
ELECTROPLATING FOR CORROSION PROTECTION (CYANIDE BATH)
?
2,000,000
21,000
PIGMENTS, PAINT, PLASTICS, INK, AND PHOSPHORS
2,500,000
6000
PLASTIC STABILIZERS PRIMARILY P.V.C.
500,000
5000
METALLURGICAL LOW MELT ALLOYS 80,000 TO 100,000 ELECTRICAL CONTACTS 50,000 SILVER BRAZE 225,000 Cu-Cd ALLOY FOR AUTO RADIATORS 15,000
900,000
1123
MISCELLANEOUS AND UNACCOUNTED FUNGICIDES NUCLEAR ENERGY PHOTOGRAPHY CURING RUBBER
400,000
BATTERIES Ni-Cd ALKALINE
400
2,000,000
REMELTING Cd PLATED AND GALVANIZED SCRAP STEEL
190,000
INCINERATION OF PIGMENTS AND PLASTICS
500
FUNGICIDES
24,500
"PERMANENT" USE UNACCOUNTED AND DISCARD 10,700,000
NATURAL OCCURRENCE AND UNINTENDED DISPERSIONS
FOSSIL FUELS 500,000,000 tons COAL AT 0.1 TO 0.5 ppm 500,000lb Cd 200,000,000 tons DIESEL AND FUEL OIL AT 0.1 TO 0.5 ppm 200,000lb Cd
140,000 TO 700,000
11,400
RUBBER TIRE WEAR
?
FERTILIZER 2-20 ppm Cd IN SUPERPHOSPHATE AT 12,000,000 tons/yr
50,000 TO 500,000
1820
MOTOR OIL CONSUMPTION 0.48 ppm NATURAL Cd CONTENT

Figure 6

Land Utilization, 48 States, 1900-1969



1. Urban and other built areas, highways, railroads, airports, parks and other land.
2. Excludes forested areas reserved for parks and other special uses.
3. Includes grassland pasture and range, private and public.
4. Cropland planted, cropland in summer fallow, soil improvement crops, and land being prepared for crops and idle.

Cropland acreages prior to 1954 are for the year preceding the date of the inventory.

Source: U.S. Department of Agriculture, Economic Research Service

help of the Earth Satellite Corp., investigated particular land use questions which have caused environmental concern. One of these was land affected by surface mining.

Data on surface mining and surface mine reclamation have not been collected on any systematic or regular basis by the Federal Government. But a national survey of surface mining and its impact on the environment was made in 1965 by the Bureau of Mines.[20] Although some individual States collect data, the report is the only detailed source of nationwide information on surface mining and reclamation.

The Bureau of Mines survey shows that 3.2 million acres of land had been disturbed by strip and surface mining by 1965. Coal mining accounted for the largest single portion of this acreage—1.3 million. Sand and gravel accounted for another 0.8 million acres, and the remaining 1.1 million acres were divided among mining and extraction of clay, stone, gold, phosphate rock, iron ore, and other commodities.[21] Only about a third of the land disturbed by surface mining had been reclaimed, and almost half of this was reclaimed by nature, that is, it had remained undisturbed sufficiently long that natural processes had healed many of the scars of the mining.

Every State had land disturbed by surface mining. But the heaviest concentration of disturbed lands lay in the eastern part of the country, particularly in the Appalachian coal-producing States. However, the amount of land used for surface mining is probably increasing most rapidly now in the Western States.

Figure 7 shows the U.S. acreage disturbed annually by coal stripping over the 5-year period from 1965 to 1970. Between 1965 and 1969, there was a gradual rise in the number of acres disturbed annually. In 1969, there was a sharp jump in the rate at which lands were being surface mined. In fact, the increase from 75,000 to 100,000 acres of new acreage disturbed between 1969 and 1970 equaled the increase from 50,000 to 75,000 acres between 1965 and 1969. These increases were due to a shift in production processes and increased demand for coal to generate electricity.

Although the Federal Government can draw on vast amounts of land use data, most of the information is not well suited as an indicator of environmental quality. Much work remains to be done before agencies agree on what data to collect and how to improve the data collecting systems. New techniques may ease the latter task. Photographs taken from high-altitude planes or satellites often can provide much of the needed land use information on a regular basis at a far lower cost than ground data collection. The applicability and effectiveness of satellite photography has not yet been determined to a degree sufficient to merit an operational earth resources satellite system. However, several test satellites will be orbited in the next year or two.

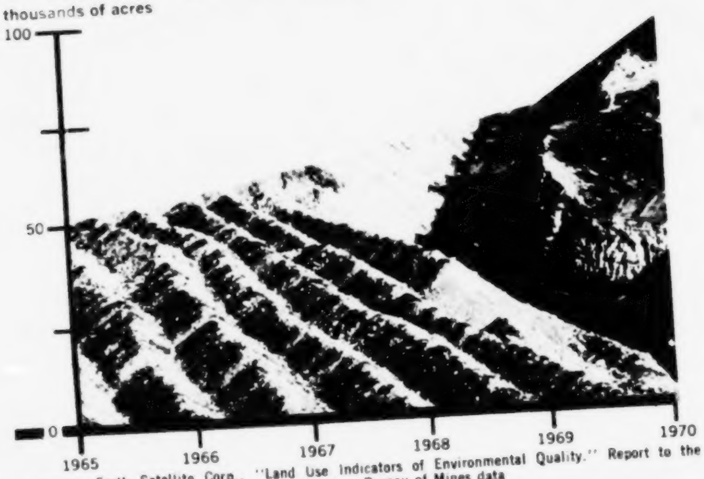
As the States develop implementation plans in anticipation of national land use policy legislation,[22] the requirements for land-use data will become clearer. Identification and control of floodplains, protection of coastal wetlands and regulation of land use in scenic districts along the shorelines of major rivers and lakes will require large amounts of land-use information if they are to be successful programs.

To determine whether regionally needed development is being blocked or unduly restricted by local governments requires an understanding of regional supply and demand factors, involving housing demand studies, evaluations of local zoning, demographic analyses, and surveys of the extent to which localities are already accommodating regional needs. And to regulate large-scale development and areas around key growth-inducing public facilities effectively, States will probably have to learn from their own and each other's experience with traffic generation, pollution loads, and the impact of such facilities on surrounding areas.

There are probably three kinds of data services that the Federal Government can furnish the States to help them cope with these problems. First, aerial photography services and uniform mapping procedures can be established for much of the Nation, with States

Figure 7

Trend in Area Disturbed Annually by Coal Stripping



Source: Earth Satellite Corp., "Land Use Indicators of Environmental Quality." Report to the Council on Environmental Quality, 1972. Based on Bureau of Mines data

drawing on relevant portions for their own use. Second, State and local governments can cull demographic, income, housing, and land use data from the U.S. Bureau of the Census and other agencies which monitor economic, manufacturing, and agricultural trends. Federal modeling efforts, such as those undertaken by the Water Resources Council, should also prove useful. Finally, the Federal Government can provide technical assistance so that land use data are properly interpreted and so that States and localities can benefit from each other's experience in land use planning and regulation.

Hard political and economic choices must be made if land development is to lead to better environmental and social results, and concern about getting a full range of data should not obscure these choices. But adequate data properly analyzed are a necessary base for sound regulatory actions, in land use as in all other fields.

wildlife

Almost everyone agrees that birds, animals, fish, and plants are essential to environmental quality. But the development of indicators for wildlife is an extraordinarily difficult challenge. Which of the thousands of wildlife species are meaningful indicators of environmental quality? And how should changes in the population of the selected species be interpreted?

Species of wildlife can benefit man in many ways—for recreation, aesthetic enjoyment, food, and natural pest control. Wildlife can also provide important scientific data and help regulate and stabilize particular ecosystems. However, some species are also harmful; they destroy agricultural crops, destroy or compete with beneficial or rare wildlife species, or carry disease.

A particular species can have a strong positive value for one purpose but slight or even negative value for another. For example, an animal that is hunted for sport may damage agricultural crops, or maintenance of its habitat may preclude desirable alternative land uses. The enivornmental significance of trends in the population of a species often is unclear. For example, a rise in the deer population in a particular area may be caused by the abandonment of farms and the resulting growth of scrub forest. An increase in the number of robins or cardinals is generally considered desirable, but an increase of gulls or rats indicates increased amounts of garbage.

Wildlife are a continuous early warning system which can alert man to the first signs of danger in the environment. Death and illness of herons, fish, shellfish, and cats preceded the deaths of over a hundred humans from mercury poisoning in Minamata and Niigata Bays in Japan. Death of seed-eating birds in Sweden warned of the mercury problem in that country. Deaths and eggshell thinning in hawks, pelicans, and many other birds warn of high levels of pesticides. Any rapid, major change in species populations should be a warning to search out the cause. Also, the variety of species which exists in a given area may be a significant indicator of environmental problems.

One wildlife measure of environmental quality is the number of species officially classified as "endangered" by the Department of the Interior. However, this measure has very limited utility. It is unlikely that all rare and endangered species have equal chances of being classified as such. Larger, more conspicuous, or better known forms are more likely to be recognized because their status is easier to assess. Year-to-year comparisons of the number of endangered species will not meaningfully indicate environmental changes until the status of virtually all rare and endangered species is established, because until then additions to the list will simply represent recognition of additional species rather than an actual increase in the number of species endangered.

The Smithsonian Institution has recommended to the Council that—in addition to wildlife habitats, wild and natural areas, and certain species of fish, shellfish, crops, plants, lichens, and mosses—28 species of birds and mammals be monitored on a regular basis.[23] These species are listed in Appendix 7. The data on these species could be combined to measure overall wildlife quality. The Smithsonian also suggested that data on selected managed species of wildlife, including land and water bird and mammal species, commercial and sport fish, and endangered species be combined to provide an index of wildlife management effectiveness.

There has not been adequate time to determine whether the indices suggested by the Smithsonian are the appropriate ones to use to measure the environmental aspects of wildlife. Nor has there been time to examine exactly how the indices would be computed. Some data are available on most of the wildlife species proposed for use in the indices. But the data are collected in a variety of forms and vary in their degree of accuracy. A start has been made to develop quantitative indices of wildlife, and this work will be continued during the coming year.

toward adequate environmental indices

The Council has compiled a preliminary list, which appears in Appendix 1 of this chapter, of those aspects of the environment which should be measured on a regular basis. It is a "mixed bag" which includes both aggregated indices (for wildlife, for example) and single items of data. It ignores the interrelationships among the separate items, although in many cases the interrelationships are the most important things to consider. If the data are available for these items, any combination or comparison of the items is possible.

During the coming year the Council will refine this list and expand it to include more detailed descriptions of the indicators and the available sources of data. Simultaneously we will work to develop indices for the major categories (the two-digit numbers on the list). Indices will be developed for the categories where adequate data are available and where work on appropriate indices is most advanced.

Indices will require not only good monitoring data but also considerable judgment and scientific research to provide the knowledge necessary to evaluate the components of an index properly. Questions such as the relative damage from various types of air pollutants require more investigation and research. One of the advantages of indices is their ability to summarize the interaction of such factors in a simple index. But this characteristic also means that the process of developing dependable indices will be a long one. Because new scientific data will constantly become available, the indices, once developed, will have to be adjusted periodically.

The work on indices will not directly improve data accuracy, comprehensiveness, and timeliness. However, it will do so indirectly by making clear what data are needed and what gaps and overlaps exist. The Council will continue to work with the Federal agencies to improve their monitoring systems. EPA, the Department of the Interior, and other agencies are making major efforts to strengthen their environmental data collection efforts, and these efforts will result in a larger and more reliable information base on environmental quality.

The Council also will encourage greater use of State and local data, a valuable source of information often not adequately tapped by the Federal Government. Common methods of data collection and analysis by Federal, State, and local agencies would facilitate exchange of information and add significantly to the amount of usable information on environmental conditions.

Neither this year nor next will we be able to provide a general statement about whether environmental quality has improved or deteriorated. The environment encompasses too many factors to be so easily characterized, as can be seen from some of the trends discussed in this chapter. Air quality in urban areas appears to be getting better, while water quality shows no strong trends, except for nutrient levels, which are rising. Production of persistent pesticides has declined, but manufacture of more acutely toxic pesticides has increased. Overall national land use patterns show little change, but certain regions and certain types of land use have changed markedly.

Although we are not now able to characterize overall environmental quality, we should be able to give a better indication of the status of and trends for particular components of the environment. The work reported in this chapter is a first step toward creating a framework for a comprehensive and continuing system of information on environmental quality.

footnotes

1. V. Brodine, "Running in Place," *Environment* 14:1 (Jan.–Feb. 1972), p. 5.
2. For other indices which have been developed, see the Mitre Corp., "National Environmental Indices: Air Quality and Outdoor Recreation" (MTR 6159), April 1972, to be made available through the National Technical Information Service.
3. The nitrogen oxides secondary standard, however, is the same as the primary standard.
4. A list of the standards is contained in Appendix 2 to this chapter.
5. For a detailed description of the computation of MAQI, see Appendix 2, to this chapter.
6. For a detailed description of the computation of EVI, see Appendix 3, to this chapter.
7. For a detailed description of ORAQI, see Appendix 4 to this chapter. Also see Oak Ridge National Laboratory, "Oak Ridge Air Quality Index" (ORNL–NSF–EP–8), Sept. 1971.
8. Memo, Dr. William C. Nelson to Acting Director, Division of Health Effects Research, EPA, Nov. 23, 1971.
9. See Environmental Protection Agency, *The Cost of Clean Water* (1972).
10. *Id.*
11. For a full description of the Enviro Control analysis, see Appendix 6 of this chapter.
12. See R. M. Brown et al., "A Water Quality Index—Crashing the Psychological Barrier," presented at the 139th Meeting of the American Association for the Advancement of Science, Philadelphia, Pa., Dec. 28, 1971.
13. The Federal Reports Act restricts the U.S. Tariff Commission to release of production figures only where there are three or more producers, no one or two of which may be predominant.
14. Stanford Research Institute, "Environmental Indicators for Pesticides" (April 1972), p. 27.
15. See U.S. Department of Agriculture, *Quantities of Pesticides Used by Farmers in 1966* (Agricultural Economic Report No. 179), April 1970.
16. *Id.*
17. State of Iowa, Community Studies Program, "1970 Annual Progress Report," submitted to EPA. Since only 50 percent of the doctors polled responded, the actual number of cases must have been well over 700.
18. Oak Ridge National Laboratory, "Cadmium: The Dissipated Element" (ORNL–NSF–EP–21) (1972, forthcoming).
19. Communication from Dr. Mel Cotner, United States Department of Agriculture, Economic Research Service.
20. U.S. Department of the Interior, Bureau of Mines, *Surface Mining and Our Environment: A Special Report to the Nation* (1965).
21. See Appendix 8 of this chapter.
22. Fred Bosselman and David Callies, *The Quiet Revolution in Land Use Control,* a report for the Council on Environmental Quality (1972).
23. Smithsonian Institution, "Environmental Indicators for Pesticides" (April 1972).

environmental indices—appendices

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appendix 1—preliminary checklist of environmental paramenters

1. Underlying Factors

1.1. Population

1.1.1 Absolute size—United States and world
1.1.2 Birth rate—United States and world
1.1.3 Death rate—United States and world
1.1.4 Age composition
1.1.5 Lifespan, by sex and race
1.1.6 Immigration and emigration

1.2. Economic development

1.2.1 GNP, absolute and per capita, by sector
1.2.2 Capital investment, by sector

1.3. Urbanization

1.3.1 Percent population in central cities and suburbs
1.3.2 Percent population, by population size of community

2. Resources

2.1. Supply and demand—renewable resources

2.1.1 Water, by region and type of use
2.1.2 Timber

2.2. Supply and demand—nonrenewable resources (United States and world)

2.2.1 Coal
2.2.2 Oil
2.2.3 Metals
2.2.4 Phosphorous
2.2.5 Uranium
2.2.6 Other

2.3. Land

2.3.1 Amount of land available for food production
2.3.2 Amount of land used for food production
2.3.3 Amount of urbanized land
2.3.4 Strip-mined land—reclaimed and unreclaimed
2.3.5 Development in flood plains
2.3.6 Land devoted to transportation-related activities—urban and nonurban
2.3.7 Amount of wetlands, by type
2.3.8 Amount of land used for public works projects
2.3.9 Wild and natural areas

2.4. Food

2.4.1 Agricultural productivity
2.4.2 World food supply vs. demand (including caloric and protein value)
2.4.3 Fish and other ocean food harvest and reserves

2.5. Solid waste and recycling

2.5.1 Amount of municipal (residential and commercial) solid waste, by type of waste
2.5.2 Amount of industrial solid waste, by source and type
2.5.3 Amount of agricultural solid waste, by type
2.5.4 Percent materials recycled, by type

2.6. Energy

2.6.1 Total BTUs of energy used
2.6.2 Electric power consumed
2.6.3 Mix of fuel used for energy supply
2.6.4 Productivity per energy unit consumed

3. Ecological Factors

3.1. Climate

3.1.1 Solar radiation amount, by type
3.1.2 Temperature change

3.2. Natural disasters

3.2.1 Earthquakes—property damage and human injury
3.2.2 Hurricanes and tornadoes—property damage and human injury
3.2.3 Floods—property damage and human injury

3.3. Wildlife

3.3.1 Wildlife Quality Index
3.3.2 Wildlife Management Effectiveness Index
3.3.3 Wildlife Habitat Index

3.4. Maintenance of major ecocycles

3.4.1 Nitrogen
3.4.2 Carbon
3.4.3 Other

4. Pollution

4.1. Air

4.1.1 Amount of emissions, by type and source (Major pollutants: SO_2, CO, oxidants, NO_2, hydrocarbons, suspended particulates)
4.1.2 Percent population exposed to levels above primary standards (health index)
4.1.3 Ambient air quality (index of ambient levels for each major pollutant and composite index for all pollutants)

4.2. Water

4.2.1 Amount of effluents, by source, type of pollutant (Major pollutants: BOD, COD, or TOD, dissolved oxygen, dissolved solids, suspended solids, phosphorus, ph, salinity, oil, phenols, fecal coliform), and type of water body used for disposal
4.2.2 Ambient water quality, by region and type of pollutant
4.2.3 Ocean dumping, amount and type
4.2.4 Number and area of lakes eutrophied
4.2.5 Percent population served by drinking water meeting standards
4.2.6 Subterranean water pollution

4.3. Radiation

4.3.1 Major radionuclides present in media
4.3.2 Average human radiation exposure
4.3.3 Number of nuclear accidents

4.4. Pesticides

4.4.1 Amounts of pesticides used, by type
4.4.2 Amount of major pesticide types in media, food, and humans
4.4.3 Injuries due to pesticides

4.5. Noise

4.5.1 Ambient noise levels, urban and non-urban

4.6. Toxic substances

4.6.1 Mercury, in media, food, and humans
4.6.2 Cadmium, in media, food, and humans
4.6.3 Other metals in media, food, and humans
4.6.4 Synthetic organic chemicals (other than pesticides) in media, food, and humans

5. Manmade Environment

5.1. Housing

5.1.1 Percent substandard housing
5.1.2 Housing availability
5.1.3 Density per square mile
5.1.4 Neighborhood quality

5.2. Transportation

5.2.1 Journey-to-work time

5.3. Aesthetics

5.3.1 Billboards and junkyards per mile
5.3.2 Proportion of urban green space

5.4. Occupational environment

5.4.1 Work injuries
5.4.2 Workplace pollution

5.5. Recreation

5.5.1 Open space—parks, wilderness
5.5.2 Cultural facilities
5.5.3 Work/leisure time ratio

appendix 2—calculation of maqi index*

The Mitre Air Quality Index (MAQI) is based upon the Secondary Federal National Ambient Air Quality Standards promulgated by the Environmental Protection Agency. These standards have been set to protect the public welfare from any known or anticipated adverse effects of air pollutants in the ambient air. The index is based upon a combination of pollutants and can include as many pollutants as national standards have been established for. The index in the text is based on sulfur dioxide, nitrogen dioxide, and total suspended particulates. However, the explanation in this appendix will also include factors for carbon monoxide and photochemical oxidants to show how the index can be calculated to cover the full range of pollutants for which standards have been set. Hydrocarbons are not covered since the national standards include them only as a guide in devising implementation plans to achieve the oxidants standard. The National Secondary Standards are summarized in Table A–1.

It is apparent from Table A–1 that a national air quality index based on these standards must be a retrospective one. The proposed index always uses data for a 12-month period spanning all seasons and may be computed and reported at any desired frequency. Daily index computation is unnecessary since several of the standards refer to annual averages, which by definition include pollutant levels in excess of the standards for many days of the year. Significant daily index variations would tend to be infrequent. The proposed index would depict changes which occur monthly or quarterly, using data for the most recent 12 months in each instance.

The Mitre Air Quality Index is a combination of individual pollutant indices each based upon one of the secondary air quality standards. This index is computed as follows:

$$\mathrm{MAQI}=\sqrt{I_c^2+I_s^2+I_p^2+I_n^2+I_o^2}$$

where

I_c is an index of pollution for carbon monoxide,
I_s is an index of pollution for sulfur dioxide,
I_p is an index of pollution for total suspended particulates,
I_n is an index of pollution for nitrogen dioxide, and
I_o is an index of pollution for photochemical oxidants.

The MAQI is the root-sum-square value of the individual pollutant indices. This method of index computation guarantees the MAQI value will be at least 1 if any pollutant included in its computation exceeds the secondary standard value. (MAQI values between 1 and 3 require inspection of the individual components, because values in this range do not necessarily imply that any standard is exceeded.) A MAQI value of less than 1 indicates that all standards are being met for those pollutants included in the MAQI computations. Because nine standards for five pollutants are involved in computing MAQI, any MAQI value greater than 3, or $\sqrt{9}$, guarantees that at least one standard value has been exceeded. The MAQI values in this chapter are based on only five standards for three pollutants, and thus for these figures any MAQI value greater than 2.24 or $\sqrt{5}$, guarantees that at least one standard has been exceeded.

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*Information in this appendix is primarily from Mitre Corp., "National Environmental Indices: Air Quality and Outdoor Recreation" (MTR-6159) (April 1972).

Table A-1

National Secondary[1] Ambient Air Quality Standards

Pollutant	Period of measurement	Concentration	
		P.p.m.	µg./m.³
Carbon monoxide	1 hour	[2]35	[2]40,000
	8 hours	[2]9	[2]10,000
Sulfur dioxide	3 hours	[2].5	[2]1,300
	24 hours	[2].1	[2]260
	Annual mean	.02	60
Total suspended particulates	24 hours	....	[2]150
	Annual geometric mean	....	60
Nitrogen dioxide	Annual mean	.05	100
Photochemical oxidants	1 hour	[2].08	[2]160

[1] The secondary standards for nitrogen dioxide, carbon monoxide, and photochemical oxidants are the same as the primary standards.

[2] Maximum concentration not to be exceeded more than once per year.

Another reason for computing the MAQI by a root-sum-square, rather than simple addition of the component indices, is based on an arbitrary choice of scaling. The values of MAQI will uniformly produce numbers which are smaller than those computed by simple summation. Furthermore, the proposed method of computation compresses the numerical range of uncertainty (regarding exceeding a standard) to values 1 to 3, rather than from 1 to 9 if simple summation were involved. The proposed computation method is no more complex than simple addition since data processing equipment would be employed.

Each of the individual pollutant indices is computed based upon the applicable Federal standards shown in Table A–1. The formulation of each index is further delineated below.

carbon monoxide index

The carbon monoxide index is the root-sum-square (RSS) value of individual terms corresponding to each of the secondary standards. The RSS value is used to ensure that the index value will be greater than 1 if either standard value is exceeded. The index is defined as

$$I_c = \sqrt{\left(\frac{C_{c8}}{S_{c8}}\right)^2 + \delta\left(\frac{C_{c1}}{S_{c1}}\right)^2}$$

where

C_{c8} is the maximum observed 8-hour concentration of carbon monoxide,
S_{c8} is the 8-hour secondary standard value (i.e., 9 p.p.m. or 10,000 µg./m.³) consistent with the unit of measure of C_{c8},
C_{c1} is the maximum observed 1-hour concentration of carbon monoxide,
S_{c1} is the 1-hour secondary standard value (i.e., 35 p.p.m. or 40,000 µg./m.³) consistent with the unit of measure of C_{c1}, and
δ is 1 if $C_{c1} \geq S_{c1}$ and is 0 otherwise.

For example, the maximum observed values of carbon monoxide in 1965 at the Chicago CAMP (Continuous Air Monitoring Program) Station were $C_{c8} = 44$ p.p.m. and $C_{c1} = 59$ p.p.m. The corresponding carbon monoxide index is

$$I_c = \sqrt{\left(\frac{44}{9}\right)^2 + 1\left(\frac{59}{35}\right)^2} = 5.17.$$

The same index for the Washington, D.C., CAMP Station in 1965 is

$$I_c=\sqrt{\left(\frac{15}{9}\right)^2+0\left(\frac{31}{35}\right)^2}=1.67\,.$$

For Washington, C_{c1} is less than the standard value and it was not really necessary to square the ratio of C_{c8}/S_{c8} and take its square root. The index could simply be calculated as

$$I_c=\frac{15}{9}=1.67.$$

In a comparison of the values of I_c for Chicago and Washington, it appears that the degree of carbon monoxide pollution in Chicago is greater than in Washington. One should be careful, however, in drawing such conclusions without a further appraisal of all of the data available. The index is merely an indicator of conditions and is not an absolute measure. The main reason for this seeming disparity is the standards themselves, which are based upon a single maximum reading and not on all data collected for a particular year.

sulfur dioxide index

The sulfur dioxide index component of the MAQI is computed in a fashion similar to the carbon monoxide index. This index has three rather than two terms, one for each of the Federal standards, and is given by

$$I_s=\sqrt{\left(\frac{C_{sa}}{S_{sa}}\right)^2+\delta_1\left(\frac{C_{s24}}{S_{s24}}\right)^2+\delta_2\left(\frac{C_{s3}}{S_{s3}}\right)^2}$$

where

C_{sa} is the annual arithmetic mean observed concentration of sulfur dioxide,
S_{sa} is the annual secondary standard value (i.e., 0.02 p.p.m. or 60 µg./m.^{3}) consistent with the unit of measure of C_{sa},
C_{s24} is the maximum observed 24-hour concentration of sulfur dioxide,
S_{s24} is the 24-hour secondary standard value (i.e., 0.1 p.p.m. or 260 µg./m.^{3}) consistent with the unit of measure of C_{s24},
C_{s3} is the maximum observed 3-hour concentration of sulfur dioxide,
S_{s3} is the 3-hour secondary standard value (i.e., 0.5 p.p.m. or 1300 µg./m.^{3}) consistent with the unit of measure of C_{s3},
δ_1 is 1 if $C_{s24}\geq S_{s24}$ and is 0 otherwise, and
δ_2 is 1 if $C_{s3}\geq S_{s3}$ and is 0 otherwise.

The observed levels of sulfur dioxide at the Chicago CAMP Station in 1965 were

C_{sa}=0.13 p.p.m.,
C_{s24}=0.55 p.p.m., and
C_{s3}=0.94 p.p.m.

The corresponding sulfur dioxide index is

$$I_s=\sqrt{\left(\frac{.13}{.02}\right)^2+1\left(\frac{.55}{.1}\right)^2+1\left(\frac{.94}{.5}\right)^2}=8.72\,.$$

The presence of the 3-hour term in the sulfur dioxide index poses something of a problem because the majority of current air sampling sites such as those included in the National Air Sampling Network (NASN) do not take 3-hour integrated samples. Larsen* has hypothesized, however (based upon the assumption that the aerometric data fit his mathematical model), that the 3-hour standard will normally not be exceeded unless a large percentage of the 24-hour readings exceeds the 24-hour standard. An inspection of air quality data, collected over several years at the CAMP Stations supports his hypothesis. When 3-hour values which exceed the secondary standard are present, the 24-hour maximum value is much larger in relation to the 24-hour standard value and tends to mask the 3-hour contribution because of the RSS method of index computation. The same general relationship is true of the 1-hour and 8-hour carbon monoxide index terms; the 8-hour term is dominant.

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*R. I. Larsen. "A Mathematical Model for Relating Air Quality Measurements to Air Quality Standards," Publication AP-89, Office of Air Programs, EPA, Research Triangle Park, North Carolina, Nov. 1971.

For the reasons detailed above, the sulfur dioxide index can be calculated for NASN and local air sampling sites (which do not measure 3-hour concentrations of sulfur dioxide) as well as for sites that utilize continuous samplers. The index in these cases is revised to be

$$I_s=\sqrt{\left(\frac{C_{sa}}{S_{sa}}\right)^2+\delta_1\left(\frac{C_{s24}}{S_{s24}}\right)^2}$$

Elimination of the 3-hour term in the index reduces the Chicago 1965 index value from 8.72 to 8.51 and does not affect the value for Washington, D.C.

total suspended particulates index

The index of total suspended particulates is computed as

$$I_p=\sqrt{\left(\frac{C_{pa}}{S_{pa}}\right)^2+\delta\left(\frac{C_{p24}}{S_{p24}}\right)^2}$$

where

C_{pa} is the annual geometric mean* observed concentration of total suspended particulate matter,

S_{pa} is the annual secondary standard value (i.e., 60 μg./m.^{3}),**

C_{p24} is the maximum observed 24-hour concentration of total suspended particulate matter.

S_{p24} is the 24-hour secondary standard value (i.e., 150 μg./m.^{3}), and

δ is 1 if $C_{p24} \geq S_{p24}$ and is 0 otherwise.

For the Chicago CAMP Station in 1965, 66 measurements were taken with a Hi-Volume Sampler. The observed concentrations were

$C_{pa}=194$ μg./m.^{3} and

$C_{p24}=414$ μg./m.^{3}.

The corresponding total suspended particulate index is

$$I_p=\sqrt{\left(\frac{194}{60}\right)^2+1\left(\frac{414}{150}\right)^2}=4.25.$$

Due to the nature of a geometric mean, a single 24-hour reading of 0 would result in an annual geometric mean of 0. The EPA recommends that one half of the measurement method's minimum detectable value be substituted, in this case 0.5 μg./m.^{3}, when a "zero" value occurs.

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*The geometric mean is defined as $\bar{g}=\sqrt[n]{\prod_{i=1}^{n} x_i}$.

**Total suspended particulate concentrations are always measured in micrograms per cubic meter.

nitrogen dioxide index

The nitrogen dioxide index does not require the RSS technique because only a single annual Federal standard has been promulgated. The index is

$$I_n = \frac{C_{na}}{S_{na}}$$

where

C_{na} is the annual arithmetic mean observed concentration of nitrogen dioxide, and

S_{na} is the annual secondary standard value (i.e., 0.05 p.p.m. or 100 μg./m.^{3}) consistent with the unit of measure of C_{na}.

For the Chicago CAMP Station in 1965, the observed annual average concentration of nitrogen dioxide was

$C_{na} = 0.04$ p.p.m.

and the index is

$$I_n = \frac{0.04}{0.05} = 0.80.$$

Considerable controversy has centered around the measurement of nitrogen dioxide concentrations in the ambient air. The annual averages obtained by first averaging continuous readings of nitrogen dioxide, obtained by the Greiss-Saltzman colorimetric method, to 24-hour averages and then obtaining the annual average from these daily averages tends to underestimate the true levels of ambient nitrogen dioxide concentration. The 24-hour integrated readings obtained by the Jacobs-Hochheiser method, which is subject to low collection efficiencies and nitric oxide interference, may overestimate the true concentration. Nevertheless, the index can still be a useful indicator of changing trends in the ambient nitrogen dioxide levels at a particular locality over time.

photochemical oxidants index

The index of photochemical oxidants is computed in a manner similar to the nitrogen dioxide index. A single standard value is used as the basis of the index which is

$$I_o = \frac{C_{o1}}{S_{o1}}$$

where

C_{o1} is the maximum observed 1-hour concentration of photochemical oxidants, and

S_{o1} is the 1-hour secondary standard value (i.e., 0.08 p.p.m. or 160 μg./m.$_3$) consistent with the unit of measure of C_{o1}.

In 1965, the Chicago CAMP Station registered a maximum 1-hour concentration of photochemical oxidants of

$C_{o1} = 0.13$ p.p.m.

The index for that year and station is

$$I_o = \frac{0.13}{0.08} = 1.62.$$

The photochemical oxidant data required for the index computation must be derived from a continuous sampler in order to obtain hourly readings. Most of the NASN and local air quality sampling sites do not presently measure this pollutant at this frequency.

combined pollutant index

In order to illustrate the calculation of the Mitre Air Quality Index, the individual pollutant indices derived from the 1965 Chicago CAMP Station data will be employed. The corresponding value is

$$\text{MAQI} = \sqrt{(5.17)^2 + (8.72)^2 + (4.25)^2 + (.8)^2 + (1.62)^2} \text{ or}$$
$$\text{MAQI} = 11.14.$$

If each of the individual pollutants had been at exactly the standard values, the MAQI would have been equal to $\sqrt{9}$ or 3. This value is arrived at by noting that nine standard values are defined, two for carbon monoxide, three for sulfur dioxide, two for total suspended particulates, and one each for nitrogen dioxide and photochemical oxidants. Hence, any MAQI value in excess of 3 guarantees that at least one pollutant component has exceeded the standards. Interpretation of this index, as of any aggregate index, should be in terms of its relative (rather than absolute) magnitude with respect to a national or regional value of the index. Cost of living and unemployment indices for a given location, for example, are frequently interpreted in this manner. It is apparent that the ambient air quality measured by the Chicago CAMP Station in 1965 was worse than the Federal Secondary Standard Values. It is not apparent, by inspection of only the MAQI value, which standards were exceeded. It is recommended, therefore, that each of the individual pollutant indices be considered together with the MAQI in order to obtain a true picture of the actual situation.

appendix 3—calculation of evi index*

Because extreme high air pollution values are most directly related to personal comfort and well being, and affect plants, animals, and property, the number or percentage of extreme values provides a meaningful measure of the ambient air quality. These values in themselves, however, do not depict the complete situation. It is still highly desirable to know the degree to which the extreme values exceed the secondary air quality standards. For these reasons, an Extreme Value Index (EVI) was developed for use in conjunction with the MAQI values. The EVI is an accumulation of the ratio of the extreme values to the standard values for each pollutant. The extreme value indices for individual pollutants are combined using the root-sum-square method. Only those pollutants are included for which secondary "maximum values not to be exceeded more than once per year" are defined.

The Extreme Value Index is given by

$$\text{EVI} = \sqrt{E_c^2 + E_s^2 + E_p^2 + E_o^2}$$

where

E_c is an extreme value index for carbon monoxide,
E_s is an extreme value index for sulfur dioxide,
E_p is an extreme value index for total suspended particulates, and
E_o is an extreme value index for photochemical oxidants.

carbon monoxide extreme value index

The carbon monoxide extreme value index is the root-sum-square of the accumulated extreme values divided by the secondary standard values. The index is defined as

$$E_c = \sqrt{\left(\frac{A_{c8}}{S_{c8}}\right)^2 + \left(\frac{A_{c1}}{S_{c1}}\right)^2}$$

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*Information in this appendix is primarily from Mitre Corp., "National Environmental Indices: Air Quality and Outdoor Recreation" (MTR 6159) (April 1972).

where

A_{c8} is the accumulation of values of those observed 8-hour concentrations which exceed the secondary standard and is expressed mathematically as

$$A_{c8}=\sum_{i} \delta_i \, (C_{c8})_i$$

where

δ_i is 1 if $(C_{c8})_i \geq S_{c8}$ and is 0 otherwise,

S_{c8} is the 8-hour secondary standard value (i.e., 9 p.p.m. or 10,000 μg./m.^{3}) consistent with the unit of measure of the $(C_{c8})_i$ values,

A_{c1} is the accumulation of values of those observed 1-hour concentrations which exceed the secondary standard value and is expressed as

$$A_{c1}=\sum_{i} \delta_i (C_{c1})_i,$$

δ_i is 1 if $(C_{c1})_i \geq S_{c1}$ and is 0 otherwise, and

S_{c1} is the 1-hour secondary standard value (i.e., 35 p.p.m. or 40,000 μg./m.^{3}) consistent with the unit of measure of the $(C_{c1})_i$ values.

At the Chicago CAMP Station in 1965, about 1 percent of the measured 1-hour carbon monoxide concentrations and 93.4 percent of the measured 8-hour concentrations exceeded the respective secondary standards. From the raw EPA data, the accumulations of these values are

A_{c8} = 16,210 p.p.m. and

A_{c1} = 2,893 p.p.m.

The carbon monoxide extreme value index for Chicago in 1965 is

$$E_c=\sqrt{\left(\frac{16210}{9}\right)^2+\left(\frac{2893}{35}\right)^2}=1803.01.$$

The same index for the Washington, D.C., CAMP Station in 1965 is

$$E_c=\sqrt{\left(\frac{1640}{9}\right)^2+\left(\frac{0}{35}\right)}=18.22.$$

At the Washington, D.C., CAMP Station in 1965, only 1.7 percent of the observed 8-hour concentrations of carbon monoxide and none of the observed 1-hour concentrations exceeded the secondary standards. Although the 1965 values of the carbon monoxide MAQI for Chicago and Washington were 5.17 and 1.67 respectively, a ratio of about 3 to 1, the extreme value indices show about a hundredfold difference in ratio. The percentage of observed values exceeding the standard also helps to depict the situation without having to inspect all of the available data. An analysis of available CAMP Station data reveals that the carbon monoxide 1-hour secondary standard is rarely exceeded even though the 8-hour standard is exceeded as much as 93 percent at the time. As an option, this carbon monoxide extreme value index could be calculated strictly from the 8-hour concentration values as

$$E_c=\frac{A_{c8}}{S_{c8}}$$

without undue disortion of the true situation. For example, the Chicago CAMP Station data yield a value of $E_c = 1801.11$ when compared with the previous value of 1803.01.

sulfur dioxide extreme value index

The sulfur dioxide extreme value index is computed in the same manner as the carbon monoxide extreme value index. This index also includes two terms, one for each of the secondary standards which are maximum values not to be exceeded more than once per year. No term is included for the annual standard. The index is computed as

$$E_s = \sqrt{\left(\frac{A_{s24}}{S_{s24}}\right)^2 + \left(\frac{A_{s3}}{S_{s3}}\right)^2}$$

where

A_{s24} is the accumulation of those observed 24-hour concentrations which exceed the secondary standard value and is expressed as

$$A_{s24} = \sum_i \delta_i (C_{s24})_i$$

where

δ_i is 1 if $(C_{s24})_i \geq S_{s24}$ and is 0 otherwise,
S_{s24} is the 24-hour secondary standard value (i.e., 0.1 p.p.m. or 260 µg./m.³) consistent with the unit of measure of the $(C_{s24})_i$ values,
A_{s3} is the accumulation of those observed 3-hour concentrations which exceed the secondary standard value and is expressed mathematically as

$$A_{s3} = \sum_i \delta_i (C_{s3})_i$$

where

δ_i is 1 if $(C_{s3})_i \geq S_{s3}$ and is 0 otherwise, and
S_{s3} is the 3-hour secondary standard value (i.e., 0.5 p.p.m. or 1300 µg/m.) consistent with the unit of measure of the $(C_{s3})_i$ values.

At the Chicago CAMP site in 1965, the observed sulfur dioxide concentrations resulted in accumulated values of

$A_{s24} = 37.52$ p.p.m. and
$A_{s3} = 38.63$ p.p.m.

where 49.9 percent of the 24-hour values and 2.5 percent of the 3-hour values exceeded the secondary standards. The index for the Chicago CAMP Station in 1965 is

$$E_s = \sqrt{\left(\frac{37.52}{.1}\right)^2 + \left(\frac{38.63}{.5}\right)^2} = 383.07.$$

An inspection of CAMP sulfur dioxide data suggests that the 3-hour standard is rarely exceeded and, when it is, the contribution of the 3-hour extreme values to the sulfur dioxide extreme value index is negligible. The index, therefore, could optionally be calculated as

$$E_s = \frac{A_{s24}}{S_{s24}}.$$

For example, computation in this manner using the Chicago CAMP data results in an index value of 375.20, a value which is 98 percent of the index value which included the 3-hour term.

total suspended particulates extreme value index

A secondary standard single maximum value not to be exceeded more than once per year is defined for total suspended particulates. The total suspended particulates extreme value index has but one term; no annual term is included. This index is computed as

$$E_p = \frac{A_{p24}}{S_{p24}}$$

where

A_{p24} is the accumulation of values of those observed 24-hour concentrations which exceed the secondary standard value and is given by

$$A_{p24} = \sum_i \delta_i (C_{p24})_i$$

where

δ_i is 1 if $(C_{p24})_i \geq S_{p24}$ and is 0 otherwise, and

S_{p24} is the 24-hour secondary standard value (i.e., 150 µg./m.^{3}).

The Chicago CAMP data for 1965 indicate that 66 Hi-Volume Sampler 24-hour measurements were taken. Of these, approximately 74.2 percent exceeded the secondary standard value. The observed accumulated total suspended particulates concentrations in excess of the 24-hour standard for 1965 at the Chicago CAMP Station were

$$A_{p24} = 11535\ \mu g./m^3.$$

The 1965 Chicago CAMP Station data result in an index of

$$E_p = \frac{11534}{150} = 76.90.$$

photochemical oxidants extreme value index

This index, like the total suspended particulates index, consists of a single term. The index is calculated as

$$E_o = \frac{A_{o1}}{S_{o1}}$$

where

A_{o1} is the accumulation of values of the observed 1-hour concentrations which exceed the secondary standard value and is expressed as

$$A_{o1} = \sum_i \delta_i (C_{o1})_i$$

where

δ_i is 1 if $(C_{o1})_i \geq S_{o1}$ and is 0 otherwise, and

S_{o1} is the 1-hour secondary standard value (i.e., 0.08 p.p.m. or 160 µg./^{3}) consistent with the unit of measure of the $(C_{o1})_i$ values.

At the Chicago CAMP Station in 1965, 1.8 percent of the observed 1-hour concentrations of photochemical oxidants exceeded the secondary standard. The accumulation of these values was

$$A_{o1} = 9.45 \text{ p.p.m.}$$

The index value is

$$E_o = \frac{9.45}{.08} = 118.12.$$

combined pollutant extreme value index

The individual pollutant extreme value indices are here combined and EVI calculated for the Chicago CAMP Station in order to illustrate the method of computation. The EVI is

$$\mathrm{EVI} = \sqrt{(1803.01)^2 + (383.07)^2 + (76.90)^2 + (118.12)^2}$$

or

$$\mathrm{EVI} = 1848.64.$$

Although this index tends to depict the degree to which the secondary standards have been exceeded, it is probably most useful as an indicator of the trend over time of the air quality in a particular locality.

A characteristic of the EVI is its tendency to increase in magnitude as the number of observations in excess of standards increases. This growth of the index value is desirable. The index truly depicts the ambient air quality only if observations are made for all periods of interest (i.e., 1-hour, 3-hour, 8-hour, and 24-hour) during the year for which secondary standards are defined. Trend analyses using EVI values based upon differing numbers of observations may be inadequate and even misleading. Further research is required to develop statistical techniques for adjusting the index values to compensate for differing numbers of observations.

The EVI and its component indices always indicate that all standards are not being attained if the index values are greater than zero. The index value will always be at least 1 if any standard based upon a "maximum value not to be exceeded more than once per year" is surpassed.

appendix 4—calculation of oraqi index[*]

The Oak Ridge Air Quality Index is designed for use with all five of the major pollutants recognized by EPA, but has been modified for use in this report. It is based on the following formula:

$$\mathrm{ORAQI} = \left(39.02 \sum_{i=1}^{3} \left(\frac{\text{Concentration of pollutant } i}{\text{EPA standard for pollutant } i} \right) \right)^{0.967}$$

The concentration of the pollutants is based on the annual mean as measured by the EPA NASN network. These are the same data on which the MAQI was based.

The EPA standards used in the calculation were the EPA secondary standards normalized to a 24-hour average basis. For SO_x, the standard used was 0.10 p.p.m.; for NO_2, 0.20 p.p.m.; and for particulates, 150 micrograms/cubic meter.

The coefficient and exponent values in the ORAQI formula mathematically adjust the ORAQI value so that a value of 10 describes the condition of naturally occurring unpolluted air. A value of 100 is the equivalent of all pollutant concentrations reaching the federally established standards.

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[*] Information in this appendix is primarily from a communication from Oak Ridge National Laboratory, Oak Ridge, Tenn.

Appendix 5

Additional Air Pollution Data for Individual Cities

Year	MAQI	EVI	ORAQI	Ratio of annual mean to EPA primary standards		
				SO_2	TSP	NO_x
			NEW YORK			
1968	6.07	20.06	246	[1]3.00	1.59	[1]2.87
1969	5.01	13.39	181	[1]1.69	1.40	[1]2.93
1970	3.48	7.38	116	[1].91	1.64	1.49
			BALTIMORE			
1968	3.51	6.95	127	1.07	1.31	1.78
1969	3.28	4.48	117	.75	1.47	1.86
1970	4.17	15.15	114	.68	1.51	1.80
			BIRMINGHAM			
1968	5.09	26.67	135	0.21	2.44	2.46
1969	4.25	22.41	107	.21	2.16	1.75
1970	5.05	16.13	76	.10	2.07	1.10
			BOSTON			
1968	2.35	3.24	84	[1]0.65	1.24	[1]1.04
1969	2.51	2.58	79	[1].80	1.13	[1].75
1970	2.12	1.09	76	[1].59	1.07	.96
			WASHINGTON, D.C.			
1968	NA	NA	NA	NA	1.15	NA
1969	1.51	0	NA	0.36	.97	1.29
1970	1.52	0	NA	[1].34	1.03	[1]1.15
			PHILADELPHIA			
1968	3.84	9.15	128	1.13	1.49	[1]1.65
1969	2.72	5.53	82	.88	1.69	NA
1970	3.99	13.38	150	1.05	1.80	2.28

[1] Data invalid for at least 1 quarter because of inadequate number of samples.

Sources: Mitre Corp., "National Environmental Indices: Air Quality and Outdoor Recreation" (MTR 6159) April 1972. Communication from Oak Ridge National Laboratory. EPA, National Environmental Research Center, Division of Atmospheric Surveillance.

appendix 6—description of enviro control water pollution analysis

There are several major problems in using existing water quality measurements for trend assessment. First, only periods of record that are relatively short (in a hydrologic sense, i.e., less than 10 years) are available in any quantity if one is interested in national coverage. Second, the data are gen-

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*Information in this appendix is primarily from Enviro Control, Inc. "National Assessment of Trends in Water Quality" (1972).

erally not sampled at fixed intervals, nor are the parameters sampled constant within and between stations. Third, the basic data at a station show a typical spread of one order of magnitude in pollutant concentration and two orders of magnitude in flow. If one uses only the pollutant concentration data, uncorrected for flow, it will be unclear whether changes are due to variations in flow or in pollution emissions. Finally, the data are, in general, non-Gaussian, i.e., they do not follow the normal statistical bell-shaped curve of distribution.

The Enviro Control analysis attempts to deal with these problems by using the following method:

a. Stations are selected on adequate coverage of key parameters, adequate sample size for each parameter, and locations of some interest nationally, e.g., major rivers or their tributaries.

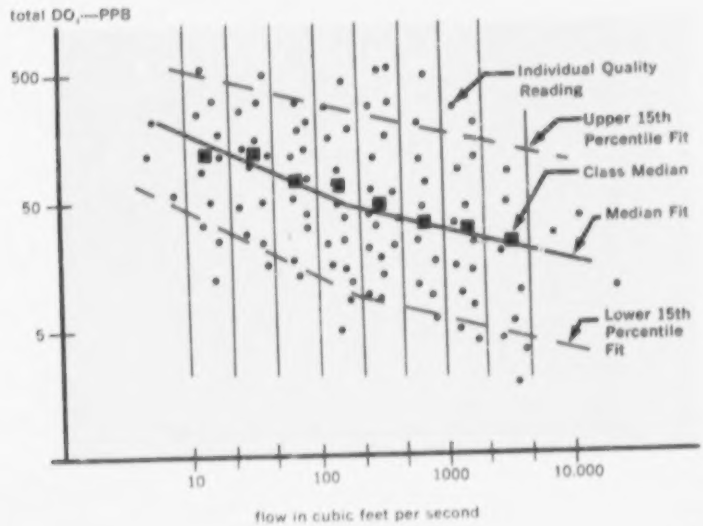
b. The stations are categorized approximately by the drainage areas they represent, i.e., little effect of man, mostly agricultural, dense population and only light industry, dense population with heavy industrial concentrations.

c. For each station and each water quality variable of interest, the concentration versus flow function and its uncertainty for a number of time periods are estimated. Figure A–1 shows the nonparametric approach used for the basic estimation, which consists of categorizing pollutant readings (plotted on log-log paper) into classes of flow levels (e.g., 3 classes per order of magnitude), taking the median pollutant concentration in each class, then fitting a function (not necessarily straight line) through the resultant medians.

Figure A-1

Estimation of Concentration vs. Flow Function

(Example — Willamette River, Oregon, Quality Readings —1966 to 1968)



To analyze variability, upper and lower 15th percentiles are also estimated in each flow category, as seen in the dashed lines of Figure A-1. Finally, concentration versus flow functions are compared for succeeding time periods to establish percentage change in concentration per unit times high, and low flow, as shown in Figure A-2. The percentage change is, in general, different for each of these points.

This basic method permits a number of investigations of interest beyond simple time trends:

a. The method is quite powerful for detecting differences before and after major events such as construction, abatement of a pollution source, etc. In this case, the C versus Q functions are fitted for the before and after periods, rather than arbitrary 2- or 3-year blocks of time.

b. Where stations measure related variables, e.g., BOD and COD, the method will determine which one is a more sensitive trend indicator.

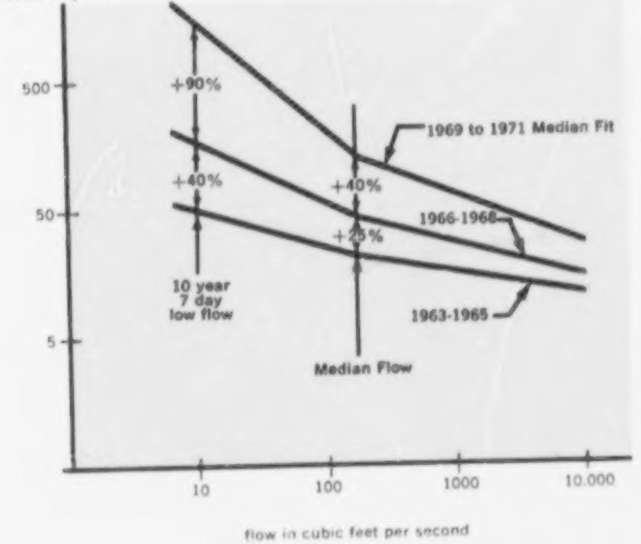
c. By iterating the method for decreasing sample sizes (or sampling frequencies), minimum frequencies to achieve given levels of trend detection can be established.

d. Of considerable interest is the analysis of trends in the upper 15th percentile of pollutant concentrations, rather than medians (where sufficient sample sizes are available). Such trends represent percent *exceedances* of given levels of pollution concentrations which are probably of even greater interest than median performance.

Figure A-2

Quality Time Trends at Low and Median Flows

(Example – Willamette River, Oregon)



appendix 7—indicator species of wildlife

Species:	Environmental aspects of which species is indicative
California Condor	Aesthetic quality, endangered species management.
Golden Eagle	Chemical contamination, aesthetic quality.
Bald Eagle	Chemical contamination, aesthetic quality.
Osprey	Chemical contamination.
Herring Gull	Chemical contamination, garbage and filth contamination.
Robin	Chemical contamination, aesthetic quality.
Bluebird	Aesthetic quality.
Cardinal	Aesthetic quality.
Mockingbird	Aesthetic quality.
Starling	Garbage and filth contamination, crop damage, urban degradation.
Red-winged Blackbird	Crop damage.
Cowbird	Crop damage.
Common Grackle	Crop damage.
Domestic Pigeon	Garbage and filth contamination, urban degradation.
Mallard duck	Recreation, wildlife management effectiveness.
Redhead duck	Recreation, wildlife management effectiveness.
Canvasback duck	Recreation, wildlife management effectiveness.
Canada goose	Recreation, wildlife management effectiveness.
Mourning dove	Chemical contamination, recreation, wildlife management effectiveness.
Woodcock	Chemical contamination, recreation, wildlife management effectiveness.
Polar bear	Aesthetic quality, endangered species management.
Norway rat	Garbage and filth contamination, crop damage, urban degradation.
Cave bats	Chemical contamination.
Prong horned antelope	Aesthetic quality, recreation, wildlife management.
Northern fur seal	Wildlife management effectiveness, endangered species management.
Sea otter	Aesthetic quality, wildlife management effectiveness.
Beaver	Aesthetic quality, wildlife management effectiveness.
Alligator	Aesthetic quality, endangered species management.

Source: Smithsonian Institution, "Development of a Continuing Program to Provide Indicators and Indices of Wildlife and the Natural Environment" (April 1972).

Appendix 8

Land Disturbed by Strip and Surface Mining in the United States as of Jan. 1, 1965, by Commodity and State (Acres)

State	Clay	Coal (bituminous, lignite and anthracite)	Stone	Sand and gravel	Gold	Phosphate rock	Iron ore	All other	Total
Alabama [1]	4,000	50,600	3,900	21,200	100	......	52,600	1,500	133,900
Alaska [3]	......	500	......	2,000	8,600	......	......	......	11,100
Arizona [1]	2,700	......	1,000	7,200	1,200	......	......	20,300	32,400
Arkansas [2]	600	10,100	900	2,600	......	......	100	8,100	22,400
California [2]	2,700	20	8,000	19,900	134,000	......	900	8,500	174,020
Colorado [1]	2,000	2,800	6,200	15,500	17,100	......	25	11,400	55,025
Connecticut [1]	......	......	100	16,100	......	......	......	100	16,300
Delaware [3]	200	......	200	5,200	......	......	100	10	5,710
Florida [1]	13,200	......	25,300	3,900	......	143,600	......	2,800	188,800
Georgia	[3] 1,300	[3] 300	[3] 6,800	[3] 1,200	......	......	[3] 100	[3] 12,000	[1] 21,700
Hawaii [3]	......	......	......	......	......	......	......	10	10
Idaho [3]	500	......	700	11,200	21,200	3,100	35	4,200	40,935
Illinois [2]	1,400	127,000	5,700	9,000	......	......	......	......	143,100
Indiana [3]	1,500	95,200	10,200	18,000	......	......	......	400	125,300
Iowa [1]	1,300	11,000	12,200	17,600	......	......	6	2,300	44,406
Kansas	[1] 1,100	[3] 45,600	[1] 7,500	[1] 5,100	......	......	......	[3] 200	59,500
Kentucky	[1,3] 2,400	[1,3] 119,200	[1] 3,900	[3] 1,700	......	......	......	[3] 500	127,700
Louisiana [1]	900	......	100	29,700	......	......	50	......	30,750
Maine [1]	400	......	4,400	28,200	12	......	100	1,700	34,812
Maryland	[1,3] 1,200	[3] 2,200	[1] 2,200	[1] 18,800	......	......	[3] 20	[1] 800	25,220
Massachusetts [1]	700	......	1,200	36,400	......	......	1,100	900	40,300
Michigan [2]	600	......	7,700	25,200	......	......	2,200	1,200	36,900
Minnesota [1]	600	......	3,900	41,600	3	......	67,700	1,600	115,403
Mississippi [3]	2,700	......	400	26,500	......	......	30	......	29,630
Missouri [2]	6,600	31,800	8,400	3,800	......	......	200	8,300	59,100

Montana [2]	...	1,500	10	[3] 13,500	5,600	100	10	6,200	26,920
Nebraska [2]	900	...	4,300	23,700	...	...	...	...	28,900
Nevada [1]	100	...	1,600	5,500	5,600	...	600	19,500	32,900
New Hampshire [2]	...	...	100	8,000	...	...	...	200	8,300
New Jersey [2]	1,400	...	2,000	27,600	...	...	1,000	1,800	33,800
New Mexico [2]	13	1,200	100	400	40	...	100	4,600	6,453
New York [1]	1,700	...	12,500	42,200	5	...	700	600	57,705
North Carolina [1]	5,800	10	6,000	18,400	2,200	300	100	4,000	36,810
North Dakota	[1] 800	[3] 7,700	[3] 300	[1] 26,100	...	...	...	[1] 2,000	36,900
Ohio	[1] 10,200	[3] 212,800	[1] 21,000	[1] 28,100	...	...	[1] 4,000	[1] 600	276,700
Oklahoma [2]	...	23,500	...	[1] 2,500	...	...	...	1,400	27,400
Oregon [2]	100	...	300	1,300	6,300	...	10	1,400	9,410
Pennsylvania	[1] 10,400	[3] 302,400	[1] 24,400	[1] 23,800	[1] 2	...	[1] 8,800	[1] 400	370,202
Rhode Island [2]	...	...	20	3,600	...	...	...	...	3,620
South Carolina [2]	10,900	...	1,400	10,400	200	8,100	100	1,600	32,700
South Dakota	[3] 2,000	[3] 900	...	[1] 28,000	...	...	...	[3] 3,300	34,200
Tennessee [2]	2,700	29,300	4,400	18,400	...	27,000	5,300	13,800	100,900
Texas [1]	6,800	2,900	21,900	122,300	...	...	9,600	2,800	166,300
Utah [2]	600	...	200	2,200	...	10	500	2,000	5,510
Vermont	...	...	[3] 2,300	[1] 4,000	...	...	...	[3] 400	6,700
Virginia	[1,3] 1,100	[3] 29,800	[1] 4,300	[1] 13,100	[1] 600	[1] 100	[1,3] 7,700	[1,3] 4,100	60,800
Washington [2]	500	100	1,300	5,700	400	...	20	800	8,820
West Virginia [2]	300	192,000	2,800	300	...	...	100	...	195,500
Wisconsin [2]	100	...	9,000	26,400	5	...	49	...	35,554
Wyoming	[1,3] 3,500	[3] 1,000	[1,3] 300	[1,3] 200	...	[3] 800	[1,3] 300	[3] 4,300	10,400
Total	**108,513**	**1,301,430**	**241,430**	**823,300**	**203,167**	**183,110**	**164,255**	**162,620**	**3,187,825**

[1] Data obtained from Soil Conservation Service, U.S. Department of Agriculture.

[2] Data compiled from reports submitted by the States on U.S. Department of the Interior form 6–1385X.

[3] Estimate.

Source: "Surface Mining and Our Environment: A Special Report to the Nation", U.S. Department of the Interior.

2 forecasting

Throughout history man has tried to forecast the future. Although the techniques have varied—astrology, consultation with oracles, modern day "think-tanks"—man has had a continuing desire to see beyond the present.

The purpose of this chapter is threefold. First, it describes the need for forecasts of current and foreseeable trends in the human environment. Second, it illustrates the complexity and difficulty of making such forecasts. Finally, it outlines some of the major factors that must be considered in making forecasts of environmental conditions.

the importance of forecasting

Our power to build and destroy has become almost limitless. The complexity of our technology and institutions has generated decisions with consequences often not apparent for many years. Given this power and complexity, predicting the future of modern society has become a very serious and urgent business. The need to forecast has been obvious for many years in managing our defense forces. Many large industrial corporations must plan 5 or 10 years ahead in order to survive. Throughout society, there is a growing need to turn from management by reaction to management by anticipation of problems.[1] This anticipatory approach to management requires a substantial amount of forecasting.

The techniques for forecasting are evolving, and a number of examples are well known, although we are still at a very primitive stage with respect to developing adequate forecasting models. *The Year 2000*, written by Herman Kahn and Anthony Wiener, presents a wide range of possible future scenarios.[2] Almost 20 years ago, Harrison Brown, in *The Challenge of Man's Future*, discussed the availability of resources in relation to population growth and technology.[3] *Resources and Man*, a projection of the carrying capacity of the earth, was prepared by the Committee on Resources and Man of the National Academy of Sciences in 1969.[4] The work of the Commission on the Year 2000 is another well-known effort dealing with the future.[5]

A large number of Federal agencies make projections on matters within their jurisdiction. The Bureau of Mines projects the availability of minerals, and the Departments of Labor and Commerce make a wide variety of economic and demographic projections—to cite just a few examples. Although these projections are highly useful, most of them are limited in scope. Even with respect to their particular subject, they take into account only a limited range of factors. The interrelationships which may exist among the different projections often are not considered, and yet man's quality of life in the future will be influenced by many interrelated factors which should be taken into account. However, the number of factors and the importance and complexity of their interaction make the forecasting of future trends very difficult.

Two studies have been released recently that provide some first halting steps in interrelating the many factors that ultimately determine future conditions. One of these studies was conducted by researchers at the Massachusetts Institute of Technology for a group of industrialists and planners known as The Club of Rome.[6] Their report predicted that

> if the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits of growth on this planet will be reached sometime within the next 100 years. The most probable result will be a rather sudden and uncontrollable decline in both population and industrial capacity.[7]

The second study is the report of the Commission on Population Growth and the American Future.[8] The Commission covered a wide range of subjects but stressed that "There is hardly any social problem confronting this Nation whose solution would be easier if our population were larger" and that a stable population, rather than having any harmful effects, would help solve many public problems.[9] Both of these reports are pioneering in the degree to which they attempt to deal with a large number of interactions relating to environmental forecasting. But there are major limitations to both, particularly the Club of Rome study, which make a number of debatable assumptions about the relevant factors and their interrelationships.

the club of rome study

The Club of Rome report is based on a computer model of the interactions among five basic factors—population, food availability, capital investment and depreciation, pollution, and resource availability. Starting from an aggregate description of the world in terms of these five factors, the model traces for about 100 years the implications of the interactions of these factors.

The key factor influencing the behavior of the model is the assumed exponential growth of population, pollution, and industrialization as opposed to the assumed linear growth of the availability of food and resources.[10] The Club of Rome model projects that, if current policies are continued, there will be a disastrous future caused either by the exponential increase in pollution or the failure of resources and food supply to keep pace with population and economic growth.

The Club of Rome model is very simplified and does not adequately describe at least two key variables—technological development and price changes. The model, in effect, assumes that the problems grow exponentially while our ability to deal with them grows linearly. Historically, technology has been developed to increase food supply, expand industrial production, and meet other human needs. The economic system has encouraged new methods to extract resources, encouraged substitution for scarce materials, and otherwise greatly expanded our resource base. Nevertheless, technology has not been able to solve all of our problems and has aggravated or created others. There is no certainty that technology will be able to keep pace with all of the wide range of problems that lie ahead. There is a great need to improve our ability to predict the pace and direction of technological innovation and adoption. This would enable us to identify problem areas in which technology is not likely to keep pace with the increase in the magnitude of the problem and to take appropriate steps to encourage technological development in these areas.

report of the commission on population growth and the american future

The Population Commission report concludes that no substantial benefits will come from the continued growth of U.S. population. The Commission's summary of its findings states that

> "The Commission believes that the gradual stabilization of population—bringing births into balance with deaths—would contribute significantly to the Nation's ability to solve its problems, although such problems will not be solved by population stabilization alone. It would, however, enable our society to shift its focus increasingly from quantity to quality."[11]

The Commission also finds that population stabilization would reap important economic benefits. The question of population growth will be discussed in more detail later in this chapter.

the difficulties of forecasting environmental trends

Not only is predicting the interrelated effects of population changes, economic development, new technology, resource availability, and social and political considerations difficult, but our ability to foresee future developments is handicapped by the indirect (secondary, tertiary, etc.) effects generated by a particular change. These indirect effects and the time lags that frequently occur between action and effect contribute substantially to making future forecasting both difficult and necessary. Also, periods of rapid change create a special need for long-term forecasting because during such periods short-term forecasts are likely to be very deceptive.

secondary effects and time lags

The most important effects of a given action often are not anticipated at the time the action is taken. The classic example was the advent of the automobile. The primary effect was to increase the speed, convenience, and availability of travel. However, the unintended and unanticipated consequences—the indirect effects—included changing the pattern of urban growth, altering the nature of the economy, and markedly influencing such basic social patterns as parent-child relationships. It was not foreseen that the automobile would aggravate problems of economic and racial separation by concentrating urban growth in the suburbs, that automobile air pollution would become a health problem, or that deaths on the highway would outnumber deaths in major wars. In fact, the indirect effects of automotive technology have probably had more impact on the society than has the direct effect of increasing the speed of travel. In the absence of knowledge, or at least intelligent predictions of such effects, neither policymakers nor the public can be aware that problems may arise.

The use of heavy metals and some synthetic organic chemicals presents similar problems. These materials are being used commercially in ever increasing amounts. The metals do not degrade, and thus when we discover that serious adverse effects may result from changing the location of a mineral through commercial use, such as taking mercury from the ground and putting it in the water, it is often too late to take effective control action. Mercury deposited in water is converted by microbes into highly toxic methylmercury which can then enter the food chain primarily through fish. It is estimated that at the current rate of microbial action, the supply of mercury now at the bottom of Lake St. Clair, Mich., will continue to be absorbed into the food chain for several thousand years.[12] There are currently no techniques available to prevent this cycle, although a number are under study.

Some synthetic organic chemicals can be quite persistent in the environment, and we know even less about their potential adverse effects than we do about the effects of heavy metals. Thus marketing and using these chemicals today may have consequences which are later discovered to be undesirable but which are irreversible in the short run. The classic case is DDT. It will take many years to rid the environment of DDT even if all use of the chemical were stopped immediately. The same is true of PCB's (polychlorinated biphenyls), a type of chemical with known toxic effects. One can construct a scenario in which man looses upon himself a substance which has very damaging effects but for which control measures are unavailable. Thus prediction and assessment of the future effects of currently proposed technologies may be a matter of survival.

We are beginning to realize our dependence on the intricate web of nature of which we are part. We have discovered that man's continued existence depends on the functions of microscopic bacteria and fungi and on the grand natural cycles which govern the flow of the major elements through the environment. If the intricate web is somehow damaged by man—through release of a chemical substance, overpopulation, changes in land use, or excess pollution, for example—it may be difficult or impossible to repair the injury.

deceptiveness of short-term projections

Everyone who keeps an appointment calendar or who gets up in the morning and ponders what he has to do that day is engaged in trying to forecast the future, albeit a short-term future. So too, policymakers inevitably must engage in future forecasting. Every new policy proposal is predicated on some implicit or explicit model of the future. For example, agricultural policy is based on assumptions about the future supply and demand for food, the anticipated reponse of farmers to policy changes, the future availability of fertilizers and new seed varieties, and numerous other factors. However, in shaping policy, how far into the future we project may be critical. Forecasts which take into account only the next 2, 5 or 10 years may be misleading.

Short-term forecasts may be particularly misleading when they examine phenomena subject to exponential growth. For example, Figure 1 shows the past and predicted growth of world population. A consideration of international policy in 1940, based only on the accurate prediction that population would grow by about 220 million in the next 10 years, would have been misleading because population increased 475 million over the following 10 years, and 600 million over the 10 years after that.

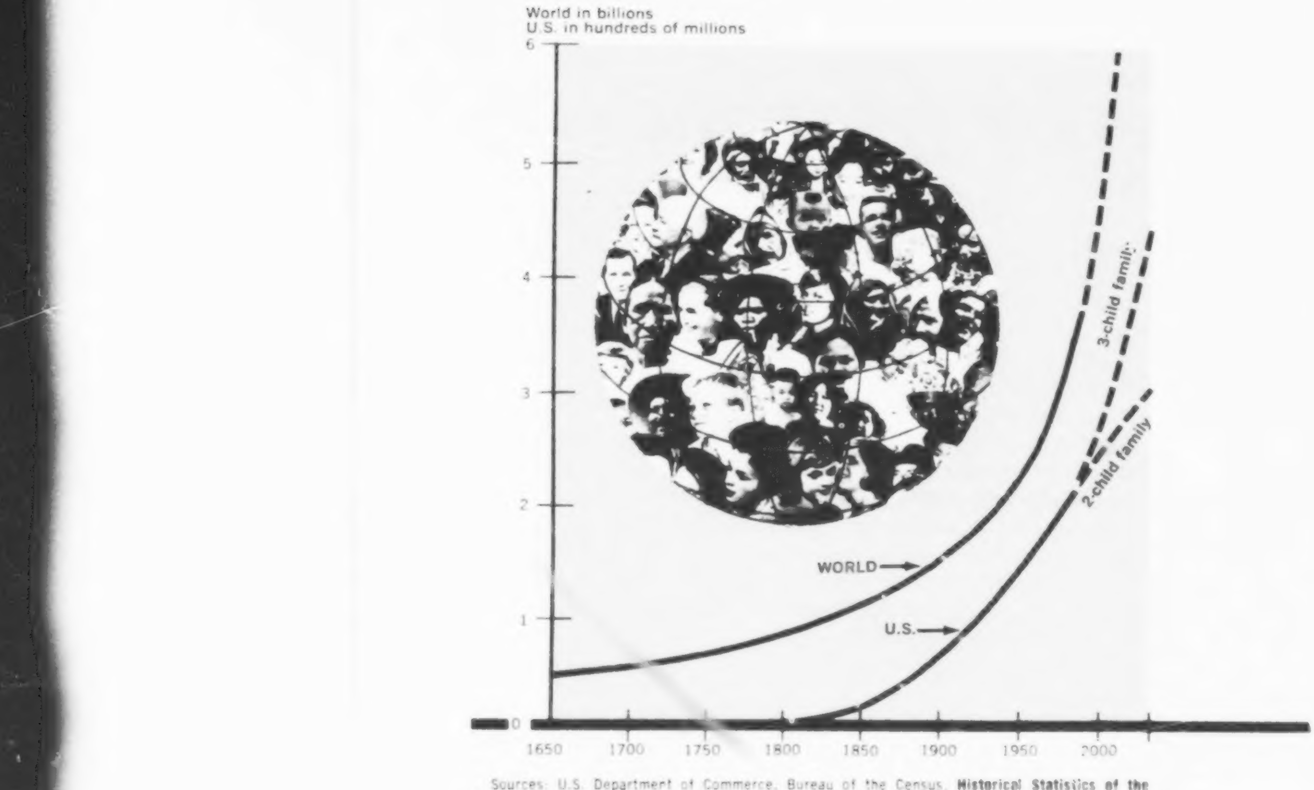
This point is illustrated dramatically by a riddle in the Club of Rome report:

> Suppose you own a pond on which a water lily is growing. The lily plant doubles in size each day. If the lily were allowed to grow unchecked, it would completely cover the pond in 30 days, choking off the other forms of life in the water. For a long time the lily plant seems small, and so you decide not to worry about cutting it back until it covers half the pond. On what day will that be? On the 29th day, of course. You have 1 day to save your pond.[13]

The press of immediate problems sometimes forces policymakers to behave like the owner of the lily pond. Rather than anticipating problems, they react to them after the problems have become more difficult and alternative solutions are more limited or of reduced effectiveness. The lack of long-range forecasts reinforces this tendency, which is a dangerous one, because by the time society is riding up the steep side of an exponential curve and the problem has become obvious, it may be too late to take action in the most effective and efficient manner.

Figure 1

World and U.S. Populations, 1650-2000



Sources: U.S. Department of Commerce, Bureau of the Census, **Historical Statistics of the United States, Colonial Times to 1957**; **Statistical Abstract of the United States 1970**; and **Population Estimates Projections** (Nov. 1971). Also, W. S. and E. S. Woytinsky, **World Population and Production, Trends and Outlooks** (1953) p. 34 and United Nations Dept. of Economic & Social Affairs, **Growth of the World's Urban and Rural Population 1920-2000** (1969) p. 56

While there is a need for long-range forecasting, the further into the future we attempt to predict, the more inaccurate the predictions are likely to be. Also, resources committed to avert future problems are resources that cannot be used to cope with current or immediate problems. If we were to reduce the production rates of certain heavily polluting industries to avert a future pollution crisis, we would lose the benefit of the added production even though everyone agreed that the loss was worthwhile. Although such factors are important and should be explicitly considered, they do not negate the pressing need to try to anticipate future events.

The need to forecast the future and the difficulty of doing so successfully can be illustrated by examining some of the basic forces that will determine future environmental conditions. We have separated these forces into what we loosely call "physical forces," technology, and social and economic factors.

physical forces influencing future environmental conditions

The physical factors—population, food supply, resources, industrial growth, and pollution—are all forces that will influence future environmental conditions. The nature of these forces and some of their interrelationships are examined below.

population

All of the elements discussed in the previous section—time lag, irreversibility, and deceptiveness of short-term data—are strikingly illustrated by the rate of population growth. The time lag results from the children who will be produced in the future by today's children. The consequences are succinctly summarized in the finding of the Commission on Population Growth and the American Future that "even if immigration from abroad ceased and couples had only two children on the average—just enough to replace themselves—our population would continue to grow for about 70 years."[11] At that time the U.S. population would be about one-third larger than it is now. In other words, because of the current size and age composition of the population, there is a minimum time lag of 70 years between initiating a stable population policy and the actual achievement of a stable population level.

The size of a nation's total population is not literally irreversible. Population could be reduced by war, famine, or disease. But given the undesirability of that trilogy, the level of population is largely irreversible when viewed from a public policy standpoint. Small declines may take place due to natural decreases in birth rates, but there are no examples of a nation experiencing marked declines in overall population because of lowered birth rates.

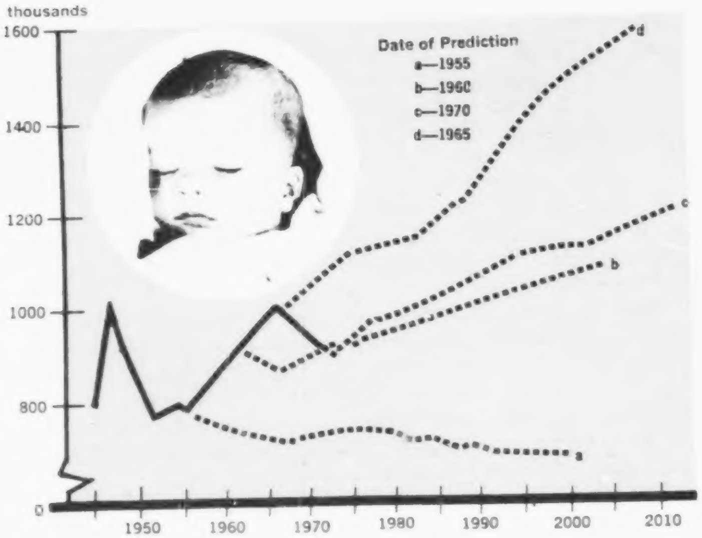
The misleading nature of short-term data on population can be seen in Figure 1. The exponential nature of population growth can produce massive increases in the absolute number of people added to the world in a very short period of time. It took thousands of years for world population to reach the one billion mark, but only about 80 years to add the second billion. At current rates of growth, the present world population of 3.7 billion will reach 4.7 billion in less than 15 years.[15]

Long-term population projections can also be deceptive because of the difficulty of making long-term forecasts. Changes in societal values, government policies, and other factors which are difficult to predict may strongly influence the rate of future population growth. The long-term projections are often based on short-term trends. This practice can lead to large forecasting errors, as Figure 2 shows.

The current rate of world population growth poses the basic issue of rapidly accelerating demand pressing on the limits of a finite planet. But with population, as with so many of the world's basic problems, the planetary distribution of difficulties is very uneven. The population problem in Bangladesh or India differs sharply in degree and impact from the population problem in the United States. The world ecology is overlaid and at the present time largely submerged by political considerations. One of the key uncertainties of the future is the extent to which national boundaries will continue to serve as

Figure 2

Predictions of the Annual Number of Births in England and Wales



Source: Maddox, John, "Problems of Predicting Population" **Nature** 236:270

barriers for maintaining the present uneven distribution of problems and resources.

Population distribution within nations is also a critical factor. Both the developed and less-developed nations have experienced a major and continuing shift of population from rural to urban locations. The projected future continuation of this shift in the United States is illustrated by the data in Table 1.

The overall implications of urbanization are complex. It is often in urban areas that the most acute social and physical problems exist. Also, pressures on open space and public facilities and the necessity for very stringent local pollution controls are sure to accompany further urbanization. Nonetheless, at least up to a point, there are increased economic opportunities and economies of scale to be achieved through urbanization.

Much of the debate about urbanization has centered on the question of density—usually meaning density of resident population. In the United States, national population density is increasing. But in many of the largest cities, the areas of highest residential density, the resident population is decreasing. Resident, or nighttime, density, however, tells only a part of the story. Daytime, or employee, density is also critical to understanding the implications of urbanization. There are large and growing numbers of people who daily commute long distances to jobs in the central cities. The economic and physical forces that produce dense concentrations of jobs, and the resulting commuting, have many environmental implications.

Table 1

U.S. Metropolitan Area[1] Population, 1960–2000

[In thousands]

	Total population	Metropolitan population	Percent metropolitan population
1960 census	179,323	118,400	66
1970 census	203,185	144,262	71
Series B[2] projections			
1980	236,020	182,530	77
1990	276,509	229,585	83
2000	320,003	273,284	85
Series E[2] projections			
1980	224,733	173,218	77
1990	246,949	203,802	83
2000	265,504	225,190	85

[1] Areas with 100,000 or more population at each date.

[2] Series B and E projections of the U.S. Bureau of the Census, U.S. Department of Commerce. Series B assumes 3.10 children per woman upon completion of childbearing. Series E assumes 2.11 children per woman.

Source: Pickard, Jerome P., "U.S. Metropolitan Growth and Expansion 1970–2000 With Population Projections," paper prepared for the Commission on Population Growth and the American Future, app., table 3.

Attempts to stem the tide of urbanization in European nations have met with mixed success, at best. In the United States there is a Federal policy to slow down the inflow of population into large metropolitan areas.[16] But the difficulty of successfully pursuing such a policy is illustrated by the projections in Table 1, which show that population growth will increasingly be concentrated in metropolitan areas. The Population Commission estimates that the maximum projected population increase of growth centers outside urban regions[17] will be 11 million between 1970 and 2000, compared to an estimated total U.S. population increase of 62–117 million.[18] The same study concludes that the large urban regions "will be called on to accommodate virtually all of the Nation's future population growth."[19]

This projected pattern of urbanization obviously will impact heavily on the quality and nature of life in the U.S. Industrial activity, transportation, and the like will be centered in large, growing metropolitan areas. The encroachment of development on the countryside will make it extremely difficult to preserve areas of critical environmental concern, such as wetlands, flood plains, and scenic areas. Given the environmental and other implications of urban growth patterns, and the length of time required to change such patterns, it is essential that we try to anticipate the problems of urbanization and deal with them before they become intractable.

food supply

The most obvious limit on population growth is food supply. Some projections, such as the one in Figure 3, show that the world's supply of arable land and therefore of food will be inadequate to support future population growth.

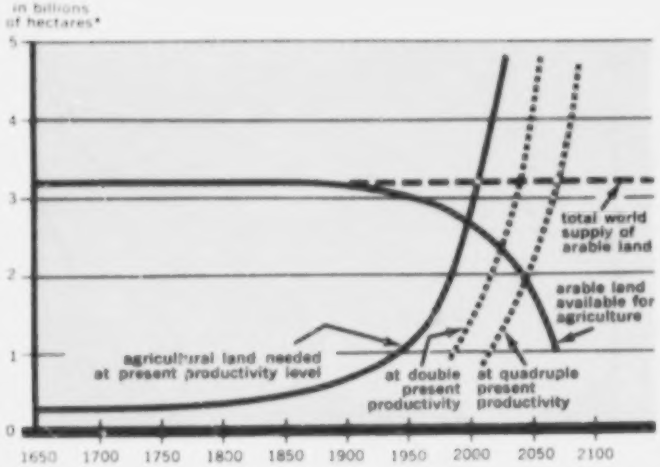
The calculation of food supply versus population at first glance may seem straightforward. The amount of arable land does not change drastically and the amount of food necessary to feed a person adequately does not change at all. However, this ignores the influence of technology.

Developments in fertilizers, pesticides, and high-yield seed strains; mechanization; and improved management techniques have increased the amount of food that can be produced on an acre of land. This increase for the United States is shown in Figure 4. A similar increase has occurred in many countries throughout the world. The total acreage used for farming in the United States has diminished steadily in the past 20 years and farming acreage in 1970 was less than it was in 1945, although population has greatly increased during the same period.[20] Thus in the United States it is clear that during the past two decades advances in agricultural technology have outstripped population growth.

If the current trends continue, the availability of food will increase throughout the world. But there is good reason to believe that current trends might not continue, or at least that the growth of food production may not be so rapid in the future—though there is still no imme-

Figure 3

World Supply of Arable Land



*1 hectare = 2,471 acres

Source: Meadows, et. al., **The Limits to Growth** (New York, 1972), p. 50

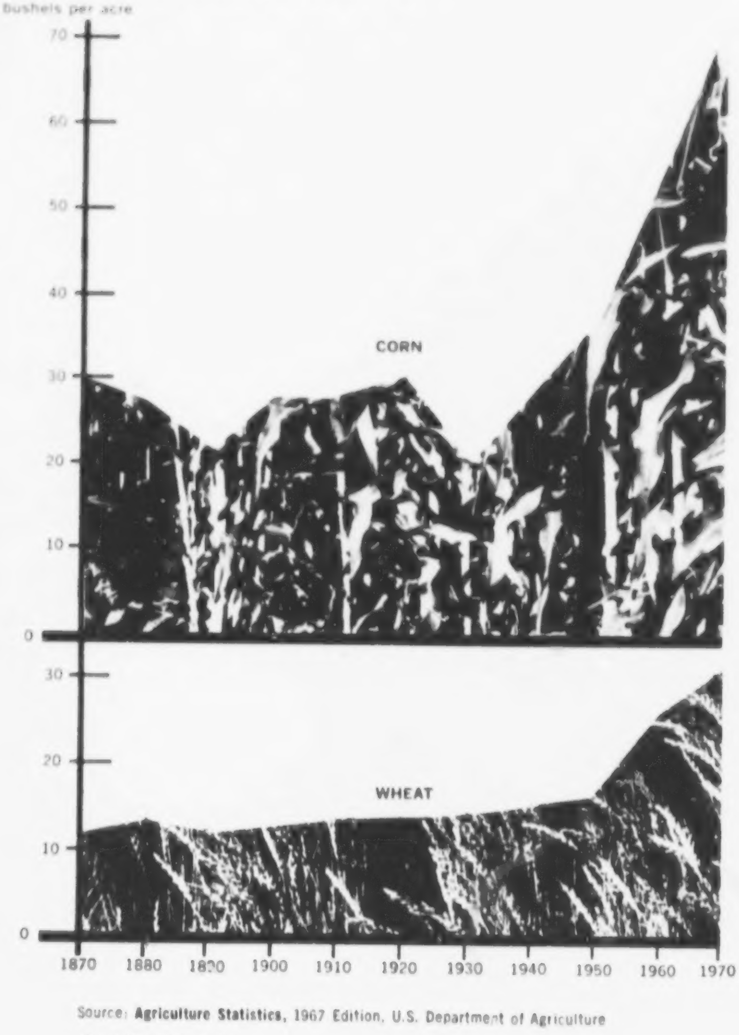
diate fear of the United States running out of food. The great increases in yield per acre which have been achieved cannot continue for long through the use of fertilizers alone because eventually a point of diminishing returns will be reached. We are already witnessing a decline in the usefulness of some chemical pesticides because pest species have built up resistance.[21] The widespread use of seed varieties developed for pest resistance may prove to be a mixed blessing because of their greater vulnerability to plant disease.[22] All of these problems are possibilities, not certainties. New technologies for raising crops may put these concerns to rest. But the example of food supply illustrates the critical influence which forecasts about technology have over attempts to foretell the future.

mineral resources

Determining the availability of mineral resources, like the availability of food, may at first glance seem to be a simple problem of comparing the supply of a particular resource to the demand. However, it is far from simple. Data on the supply of any particular mineral are uncertain, because it is difficult and expensive to determine the extent and location of as-yet-undiscovered supplies; because the availability will depend on the market price of the mineral and on the technology of extracting and processing it; and because supply may

Figure 4

U.S. Harvested Yield per Acre, Corn and Wheat, 1870-1970



Source: **Agriculture Statistics**, 1967 Edition, U.S. Department of Agriculture

Excludes net exports

be interrupted by political factors which halt shipment of the resource from one nation to another. Estimates of demand are also subject to a large number of variables, including levels of population and industrialization, technological innovations, the price of the resource, the degree of recycling, and the extent to which substitute materials are used.

Table 2 illustrates several of these problems. The range of demand estimates and the differences between the two sources of data used (U.S. Bureau of Mines and Resources for the Future) point up the difficulty of obtaining precise figures. The table shows that a large proportion of the world demand comes from the United States, although the source of many of the minerals is other countries and is thus subject to political complications. For example, the United States uses 25 percent of the world's chromium, but almost none of the chromium reserves is located within the United States. The situation is similar for such important resources as tin, cobalt, and manganese.[23]

Although the importance of the price of the mineral is not reflected in Table 2, for many minerals a doubling of the price would more than double the available reserves. When the price of a particular mineral rises, lower-grade ore bodies become commercially producible and, in addition, it generates an incentive to search for and exploit new sources, to pursue technological innovations for extracting or processing the mineral, and to increase recycling. Previously uneconomic sources or extraction methods may become economically viable, and at the same time, the demand for the mineral may decline as substitute materials or end products become more economically attractive.

If one looks at the world reserves vs. world demand figures in Table 2, it appears that some minerals will be in very short supply and that in the case of others there is little cause for immediate concern when viewing the world as a whole. However, demand is rising steeply as population and industrialization increase, and a comparison of estimated demand in 2000 compared with the demand in 1969 shows that figures for the next 30 years may be quite deceptive. The cumulative demand between 1969 and 2000 may be almost insignificant compared with the demand that will follow between 2000 and 2030, because of the exponential increase in consumption of mineral resources. Alternatively, technological changes, i.e., new substitute materials and new methods of extraction or processing, may eliminate resource scarcity, at least as currently defined, as a serious problem.

Even if ample resources were available, however, their geographic distribution might still result in political uncertainties creating a scarcity in particular nations. The interim report of the National Commission on Materials Policy has noted that, "It is clearly evident from the commodity summaries and the projections that in the case of a majority of our basic materials, the gap between our [U.S.]

Table 2

Resource Demand—Reserve Balance (1968-2000)

Material Source of info	Cumulative world demand 1968-2000 as a percent of present world reserves at 1969 prices	World demand in 2000 as a percent of world demand in 1969	U.S. demand in 1969 as a percent of world demand in 1969
Aluminum:			
BoM[1]	28-43	350-734	32
RFF[2]	24-36	215-601	
Chromium:			
BoM	65-82	129-280	25
RFF	67-86	129-270	
Coal			
BoM	2-3	146-228	17
Cobalt:			
BoM	40-44	134-194	42
RFF	43-53	136-205	
Copper:			
BoM	125-211	258-535	26
RFF	141-211	303-598	
Gold:			
BoM	136-167	143-200	19
Iron:			
BoM	20-24	173-237	20
RFF	19-23	154-216	
Lead:			
BoM	251-312	143-203	24
RFF	265-303	162-208	
Magnesium:			
BoM	12-18	130-223	21
RFF	13-17	127-221	
Manganese:			
BoM	68-84	177-259	14
RFF	71-86	186-260	
Mercury:			
BoM	197-256	130-219	24
Molybdenum:			
BoM	67-80	310-416	39
RFF	69-83	319-434	
Natural Gas			
BoM	176-264	310-505	63
Nickel:			
BoM	48-58	180-300	30
RFF	51-63	220-300	
Petroleum			
BoM	158-256	245-470	34
Phosphorus:			
BoM	33-46	352-669	29
RFF	36-51	370-655	
Potassium:			
BoM	43-56	319-497	26
RFF	49-62	348-513	
Silver:			
BoM	224-325	157-333	31
Tin:			
BoM	153-208	209-384	25
RFF	220-306	349-387	
Tungsten:			
BoM	122-155	215-305	20
RFF	133-155	222-290	
Uranium			
BoM	128-206	180-896	41
Vanadium:			
BoM	9-14	241-474	42
RFF	12-15	328-447	
Zinc:			
BoM	167-213	185-312	29
RFF	215-252	229-300	

[1] BoM stands for Bureau of Mines.

[2] RFF stands for Resources for the Future, Inc.

Sources: Bureau of Mines, unpublished data; "Resource and Environmental Consequences of Population Growth in the United States," Ronald G. Ridker, editor, Resources for the Future, 1972.

requirements and the remaining easily accessible world supplies is widening."[21] The demand for minerals in this country is expected to increase fourfold by the year 2000. If a large portion of this increased demand is to be met by foreign mineral sources, questions concerning balance of payments, national security, employment, capital investment flow to foreign nations, and other factors will have to be faced.

industrial growth

The Gross National Product (GNP) is the total of goods and services produced, and thus serves as a rough indicator of the economic development of a nation. Figure 5 shows that the U.S. GNP is growing very rapidly. Many other countries are also experiencing rapid growth of GNP.

Economic development or industrialization interacts with environmental quality in several very important ways. It may adversely affect environmental quality by increasing pollution and by consuming resources. However, it may also aid in improving environmental quality by providing the necessary capital for control measures and for technological advances. Further, a certain level of economic development is necessary to provide the goods which are a vital component in any definition of a satisfactory life. Thus, the tradeoffs between using resources to solve environmental problems and using them for other kinds of economic development must be carefully weighed.

Current measures of economic development do not adequately reflect these considerations. With regard to economic data, it is important to note the caution contained in the President's 1972 Environmental Message:

> Our national income accounting does not explicitly recognize the cost of pollution damages to health, materials, and aesthetics in the computation of our economic well-being. Many goods and services fail to bear the full costs of the damages they cause from pollution and hence are underpriced.[22]

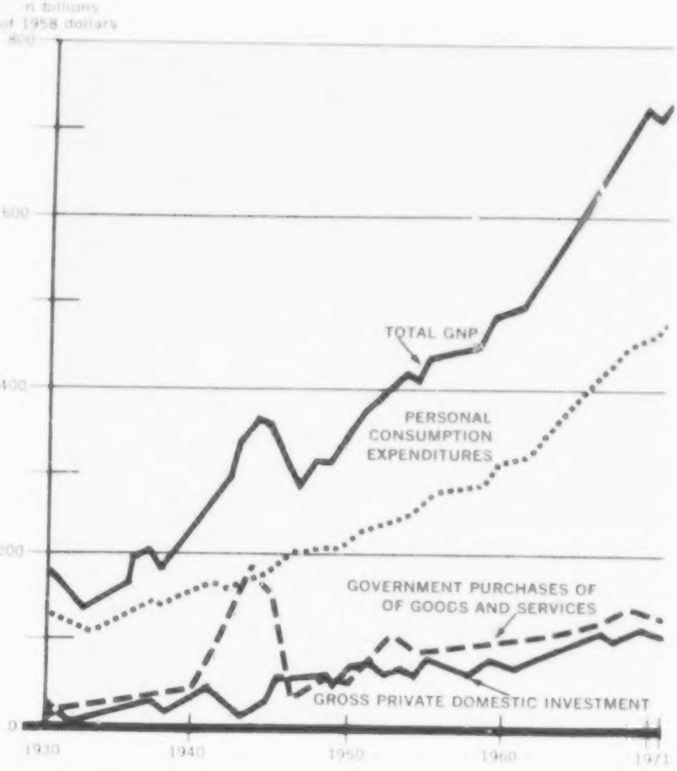
Thus, the tradeoff between economic progress and environmental quality must be made explicitly, for it is not encompassed within the standard indicators of economic development. When forecasting future developments, the interaction between economic factors and other important environmental values must be carefully considered.

pollution

Future pollution levels will be determined by the physical factors discussed above as well as by the technological and social factors discussed below. The projections of water pollution, using alternative assumptions, in Figure 6 point out the importance of these factors. The amount of pollution will hinge on changes in total population, level of GNP, the stringency of abatement policies, the adoption of new industrial technologies, and other factors, such as urbanization and hydrological cycles, which are not shown in the table.

Figure 5

U.S. Gross National Product by Sector, 1930-1971



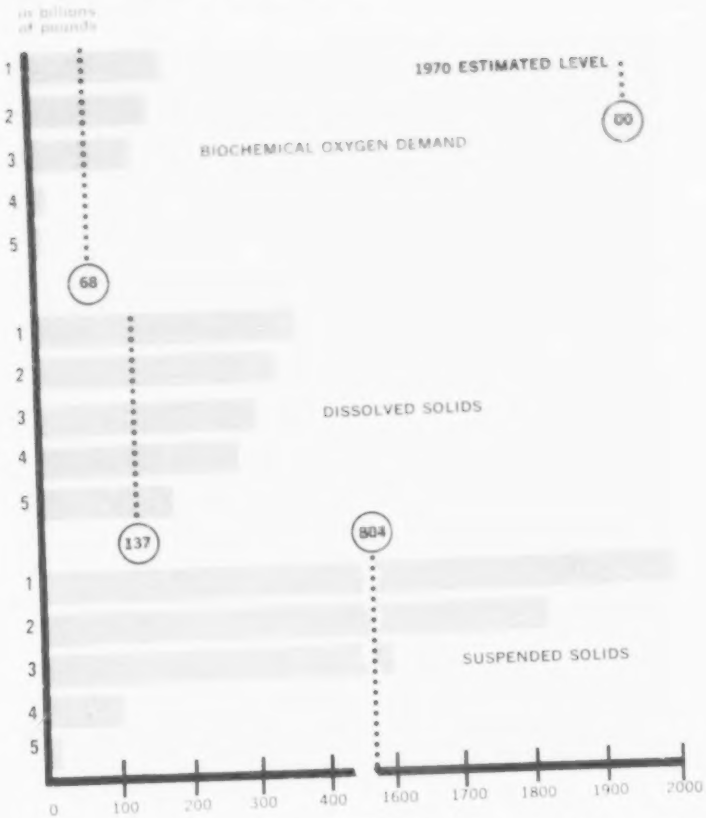
Excludes net exports.

Source: Council of Economic Advisors, Annual Report 1971

Because both U.S. population and GNP will rise between 1970 and 2000, perhaps the key question in forecasting future pollution loads is the extent to which the pollution increases, caused by population and GNP growth, will be counterbalanced by changes in industrial processes and by tighter pollution controls. If new industrial technologies are widely utilized and secondary treatment of wastes is required, then projected water pollution in the year 2000 will be less than it is now. If tertiary treatment were required, year 2000 levels would fall dramatically below current levels.

Figure 6

Water Pollution, Year 2000 Under Alternative Assumptions



Assumptions

1. Census Bureau Population projection "B" (3-child family), high GNP ($2.6trillion), current levels of waste treatment, current production technology.
2. Same as assumption 1 except Census Bureau projection "E" (2-child family).
3. Same as assumption 1 except production technology equal to current most advanced technology available.
4. Population and GNP assumptions same as #1, secondary treatment of all waste, production technology equal to current most advanced technology available.
5. Same as assumption #4 except assumes advanced treatment (rather than secondary treatment) of all waste.

Sources: Based on data from I. Ayres and I. Gutmanis, "A Model for the Strategic Allocation of Water Pollution Abatement Funds" (1971), prepared for the Brookings Institution; and International Research and Technology Corp., "Effects of Technological Change on, and Environmental Implications of an Input-Output Analysis for the U.S., 1967-2020" (1971), prepared for Reseources for the Future. The Council was assisted by I. Gutmanis in computing this data.

Abatement policies are probably the most important factor in determining future pollution loads. However, changes in the technology of industrial production also are a critical variable, because such changes are important in curbing waste discharged by a plant. For example, in pulp production, a major source of water pollution, there has been a significant shift from use of the sulfite to the sulfate (Kraft) production process. Between 1945 and 1969 the proportion of total woodpulp production using the sulfite process declined from 23 percent to 9.5 percent. The proportion produced by the Kraft process increased from 44 percent to 67.5 percent.[26] Substitution of the Kraft for the sulfite process reduces considerably the dissolved organic compounds and waste water load, as well as SO_2 emissions. On the other hand, it increases certain other kinds of pollutants.

The data in Figure 6 cover only gross pollutants, not contaminants such as metals or synthetic organic chemicals found in trace (small) amounts. But the trace contaminants may be more important to public health—and there are a large number of them. For example, automobile exhaust, a major source of air pollution, may contain, besides the major air pollutants, lead, ethylene dichloride, phosphorus and boron compounds, alkylated phenols, alcohol, ammonia derivatives, and a variety of other substances.[27]

the critical role of technology

The future of all the physical factors discussed above depends to a great extent on the future development of technology. At least since the invention of the wheel, man has used technology to overcome physical limitations. By prudent use of improved technology, land can be made to grow more food, substitutes can be developed for scarce natural resources, birth control methods can be improved, and devices can be made for controlling pollution.

However, new technology also can create many new and often unanticipated problems. Automotive air pollution, persistent pesticides, and nondegradable solid wastes, for example, are the fruit of technological innovations.

For good or ill, the contemporary world is and will continue to be substantially shaped by technology. Thus any attempt to look at what lies ahead must consider new technological developments, and we must improve our ability to assess and deal with the impacts of new technologies.

Predicting future technological trends is perhaps the most critical component of any forecast of the future. But it is also the most difficult to calculate. Many eminent men have made totally wrong predictions about future technological developments. For example, H. G. Wells, one of our better prophets, writing about the airplane in 1902, predicted that "aeronautics will never come into play as a serious modification of transport and communications." [28]

J. B. S. Haldane, one of the foremost interpreters of modern science, wrote in 1925 that

> If we could utilize the forces which we now know to exist inside the atom we would have such capacities for destruction that I do not know of any agency other than divine intervention which would save humanity from complete and peremptory annihilation. But . . . the prospect of constructing such an apparatus seems to me so remote that, when some successor of mine is lecturing to a party spending a holiday on the moon, it will still be an unsolved (though not, I think, an insoluble) problem.[28]

In 1937 the National Research Council issued a report on *Technological Trends and National Policy*. As Robert Ayres has noted, the report recognized that

> intelligent long-range planning requires insight into the social, technological, and military environments which will exist in the future. Yet this study failed to foresee atomic energy, radar, antibiotics, or jet propulsion, all of which were under high-priority engineering development or in practical use 5 years later.[29]

Unlike physical factors, technological innovation is dependent upon a creative process. Some individual or group must come up with the new ideas, the new solution to a problem, which eventually results in the application of new technology. It is difficult, if not impossible, to predict precisely the rate or direction of this creative process. The nature and timing of scientific and technological developments and their rate of application remain subject to many unpredictable factors.

Past trends are not very useful for predicting the rate of technological innovation or the contributions which technology will make toward solving particular problems. Technological applications tend to grow out of basic scientific discoveries, and the basic scientific breakthroughs are limited to particular areas. Thus the pace of innovation often is very different for different areas. Basic discoveries about genetic biology in the past few years make it likely that the coming years will see innovations in dealing with birth control, prevention of birth defects, and similar problems. Thus an area which 20 years ago was producing little in the way of new technologies is now producing, and probably will continue to produce, a variety of innovations. Conversely, the period of 1940–50 produced many new chemical pesticides, whereas there has been little innovation in this area in recent years, and there is no indication that such innovation is forthcoming. Not only is the pace of technological innovation different for different areas, but the rate and time required for the widespread adoption of new technologies vary widely.

Even if one knows the nature of a particular technological innovation, it may be extraordinarily difficult to predict what its impact on the world will be. We have already discussed this with respect to the automobile. To take a more elementary example, it is quite doubtful that the inventor of the fly screen foresaw that in many less-developed countries his invention would markedly improve public health—because of reduced disease transmission from insects to humans—leading to a reduction in the death rate, a significant increase in population size, a great strain on the economy, and political instability, among other things. If he had tried to think of all these consequences, he might not have had time to invent the fly screen in the first place.

The key question is whether technological innovation will keep pace with population, industrial growth, and changing life styles. There are two lines of argument suggesting that it will. The first is that it has experienced very large growth in the past, at least in some of these areas, such as food production. The second is that the base of scientific knowledge needed to permit technological innovation is increasing rapidly. For example, the number of scientific articles published, and (until the last few years) the number of scientists and engineers employed in research and development have been growing rapidly. Most of the scientists who ever lived are still alive today. However, both of these factors are offset in part by the uneven pace of development in different areas. If the rate of technological innovation taken as a whole could be measured, it might be growing at an adequate rate. But we might still suffer because the necessary technology in a particular field had not developed sufficiently fast.

Techniques to forecast the introduction of new technology more accurately are being developed, but we must also improve our methods for assessing the impact of new technologies. For example, if there were to be significant advances in the technology for underground tunneling, it is likely that there would also be a significant increase in subways and in underground urban highways. Analysis should be able to project the impact of these developments on the economy of central cities, on residential patterns both in the central city and the suburbs, and on air pollution levels in metropolitan areas. We must do better in assessing these secondary impacts before the widespread adoption of the new technology—even when we suspect the results to be favorable.

We must also develop the institutional mechanisms capable of making such assessments, although care must be taken not to stifle the development of new technology. The environmental impact statement process under the National Environmental Policy Act and the advanced testing requirements in the proposed Toxic Substances Control Act are two examples of institutional mechanisms for technology assessment. A variety of other mechanisms exists, but their effectiveness in examining secondary and tertiary effects must be improved, and the knowledge that this brings must be better utilized.

social and economic factors

Although we have labeled the basic factors discussed at the beginning of this chapter "physical" forces, they are, in fact, strongly influenced by human actions and attitudes. Man exercises considerable control over his destiny. Thus the role of political, economic, and other institutions must be considered as independent and powerful influences over the future condition of the world.

the distribution of resources and problems

The uneven distribution among nations of the pressures of population growth has already been noted. Great disparities in both resources and problems exist among nations, and these disparities are growing. Projections in the Club of Rome report indicate that if current trends in population and GNP growth continue, by the year 2000 the per capita GNP in Japan will be $23,000, in the United States, $11,000, but in India, only $140, and in China, $100.[31] These figures, of course, represent simply a projection of current trends and are not likely to work out that way. Looking at the problem from another perspective, the United States, with a high standard of living, has a per capita energy consumption six times the world average. The United States produces two-thirds of the world's telephones and half of the world's transistors.[32]

These disparities trace back in part to variations in natural resources and population levels within particular countries. And in part they represent differences in institutional and technological development among nations. These disparities are aggravated by the cumulative growth of national economies and technological skills which leads to much greater absolute growth in the developed nations than in the less developed ones. The *increase* in the U.S. GNP between 1970 and 1971 was greater than the *total* 1970 GNP of all of Africa.[33] The GNP of almost all nations is increasing, but at the same time, the gap is widening between the rich and the poor.

The dominant role played by social and economic factors in solving the world's basic problems is most apparent in the obstacles that hinder the exchange of resources and goods between nations. The balance of payments and relationships between imports and exports are major policy issues in almost every nation of the world, and they are issues which hinder efficient exchange of resources. One need only look at the extraordinary difficulties of distributing United States surplus food to nations which need additional food to see the impact which international economic considerations can have on the satisfaction of basic needs. To take another example, there is presently no worldwide shortage of oil, but economic and political considerations make oil supply a major and growing problem for many of the developed nations.

Within nations, social factors also can be a determining factor and should be considered in predicting the effects of a given action. Even when the technology is available to solve basic problems, cultural mores and institutional inadequacies often interfere. Adoption of new agricultural practices, which are part of the "Green Revolution" to increase the food supply in less developed countries, has been retarded in some nations by religious and cultural factors. For example, it has been reported that in much of India, rice is the prestige crop, both for production and consumption, and thus a change to coarser grains may be resisted even though far more food could be grown that way.[34] Although cheap and easy-to-use birth control methods are available, they have not had a significant impact on population in Latin America, India, and other nations because of a variety of cultural and institutional barriers. Within the United States, technology is available to control many, if not most, of the worst forms of pollution, but it has not been fully applied.

Social disruption within a nation often creates acute problems. The most glaring instances of mass starvation, such as in Biafra, for example, have been caused not by any absolute lack of food but by wartime disruption of harvesting and distribution of the food.

National and international institutions and cultures also may be quite effective in easing or solving problems. For example, the workings of the marketplace tend to reduce problems of resource scarcity. As a resource becomes scarcer, the price rises, thereby reducing the demand and making it profitable to switch to available substitutes or to develop new ones. Religious and cultural practices have let man adapt to a variety of conditions in many ingenious ways by adjusting his expectations to the condition of his environment.

Currently we are undergoing significant changes in goals, values, and life styles. As noted by the National Goals Research Staff, "We have rising expectations and changing values concerning the goals we should set for ourselves both in resolving existing inequities and in improving the quality of our lives."[35] Within the limits of available resources, such changes in values, goals, and life styles can help solve society's problems. Whether their impact is positive or negative, changing values will play a key role in almost all major aspects of the future.

Government policies also have a role. Governments pursue a vast variety of policies and programs designed to alleviate problems ranging from hunger to traffic congestion. They sponsor research to develop needed technology; control, or at least influence, the output of the economy; and pass laws directed at the variety of problems faced by the society.

In the context of forecasting the future, government policies are the social equivalent of individual free will, i.e., they are the factors which allow a creative response to the conditions created by all of the other factors. What actions governments will take and how effective they will be are to a great extent unpredictable. In part this is because the actions will be influenced by all of the other trends, actual or predicted, and in part it is because all of the other trends can be influenced by governmental action.

interrelationship of factors determining the future

All of the factors discussed above—population, food supply, resource availability, industrial growth, pollution, technology, economic, government policy, and other social factors—are closely interrelated, and they directly help shape our future environment. They may be separated for some analytical purposes, but in fact they are part of a single, constantly changing world, and if we are to look into the future, they must be understood and treated as part of one dynamic system.

The interrelationships emerge in any examination of the factors. Population determines, in part, the availability of food and resources, industrial growth, and the degree of pollution. And in turn each of these factors can influence the level of population. The same mutual interrelationship exists for all of the physical, technological, social and economic factors. The relationships are not simple one-directional, cause-and-effect relationships but rather mutually interacting aspects of a dynamic system.

The complex nature of each of the factors, combined with the intricacy of their interrelationships, makes the task of tracing alternative paths into the future very difficult. However, systems analysis, the computer, and other tools are making it possible to do a better job of forecasting by allowing us to deal simultaneously with a large number of variables. We can never be sure how accurate forecasts are. Although models can be tested with respect to the present by using actual past data, the patterns of the future may be very different from those of the past. There is no way to prove the validity of predictions except to wait until they are no longer predictions, but realities. But as our methods of analysis become more sophisticated and our data are improved, there is increasing reason to rely more heavily on the results of our forecasting.

There are many who question the usefulness of long-range forecasting. They argue that forecasting very far into the future is illusory because the results will often or possibly always prove to be wrong; that resources have been and will continue to be allocated efficiently and effectively by market forces; that technological innovation has and will continue to keep pace with the world's problems; and that man is ingenious in solving problems and will be able to surmount any difficulties that arise. We cannot take such a sanguine view. Modern science and contemporary institutions have eliminated many problems, but they have the potential to greatly magnify man's mistakes as well as his progress. They have not solved many pressing problems of today—pollution, urban decay, or traffic congestion. Even adequate nutrition for the bulk of the world's population still defies economic and institutional solution, although progress in all these areas is being made. Although we do not predict inexorable disaster for the human race, we do not believe that technology and the marketplace will automatically solve all problems.

The need to look ahead is imperative. The present period of history is not like any period of the past, and we can be sure that the future will be very different from the present. Thus many mistakes will be made in trying to look ahead. But we are able to foresee many problems and opportunities, and as we engage in future forecasting, our predictive skills will improve still more.

Man is not a captive of uncontrollable forces. He can exercise a significant degree of control over his future if he has some idea of the problems which lie ahead. Population control, greater recycling of resources, improved methods of technology assessment, and a variety of other policies and practices can be utilized now if they are necessary to deal with future problems. What is at stake is the quality of life for our children and for the human race. With such stakes we cannot afford to limit our vision to the present or the short-range future, even though they may seem to present more than enough problems to utilize our capability fully.

footnotes

1. See National Goals Research Staff, *Toward Balanced Growth: Quantity with Quality* (1970).
2. H. Kahn and A. Wiener, *The Year 2000* (1967).
3. H. Brown, *The Challenge of Man's Future* (1954), p. 265.
4. National Academy of Sciences, Committee on Resources and Man, *Resources and Man* (1969).
5. Commission on the Year 2000, *Toward the Year 2000: Work in Progress,* Daedalus, Summer, 1967.
6. Meadows, et al., *The Limits to Growth* (1972).
7. *Id.*, p. 23.
8. Commission on Population Growth and the American Future, *Population and the American Future* (1972).
9. *Id.*, p. 1 (Signet edition).
10. Exponential growth is growth that takes place at a certain *percentage* each year (for example, a bank account which collects interest at 5 percent annually without additions to the principal other than the annual interest) whereas linear growth takes place through the addition of a certain *amount* each year (for example, a bank account which collects no interest but to which is added $100 a year). Over a long enough period of time, exponential growth always will outstrip linear growth. Because exponential growth involves a percentage increase, an exponential growth rate can also be expressed in terms of a constant doubling time, the amount of time it will take to double the quantity of the units involved. This way of expressing exponential growth also brings out the rapidity with which such growth can take place. If one puts a penny on the first square of a checkerboard, two pennies on the next square, four pennies on the next, and so on, doubling the amount each time, on the last square of the checkerboard one would have to put down approximately $92,100 trillion.
11. Commission on Population Growth and the American Future, *Population and the American Future--Themes and Highlights* (1972), p. 9.
12. Communication from Prof. John Wood, University of Illinois.
13. Meadows, et al., *supra* note 6 at p. 29.
14. Commission on Population Growth and the American Future, *supra* note 8 at p. 15.
15. Calculation based on United Nations Department of Economic and Social Affairs, *Growth of the World's Urban and Rural Population 1900-2000* (1969), p. 56.
16. P.L. 91–524, the Agricultural Act of 1970, states that the Congress commits itself to a sound balance between rural and urban America and directs heads of all executive departments and agencies of Government to locate new offices and facilities in areas or communities of lower population density. The President's proposals for rural community development revenue sharing and rural development credit sharing are intended

to help States and local governments slow the outmigration of population from rural areas. The President's State of the Union Message of January 20, 1972, spoke to the problem of rural areas being emptied of people and stated that, "we should work to reverse this picture by including rural America in a nationwide program to foster balanced growth." The President's message to the Senate on March 5, 1971, on special revenue sharing stated: "We are taking a number of steps to encourage more development and settlement in less densely populated areas of our country."

17. An "urban region" is defined as a coterminous area containing a total population of at least one million. It can be one or more contiguous metropolitan areas and adjacent to intervening counties with relatively high population density. Or it can be single counties of lower density which contain a major transportation corridor linking two or more metropolitan areas.
18. Pickard, *U.S. Metropolitan Growth and Expansion 1970–2000, with Population Projections*, p. 37.
19. *Id.*, p. 38.
20. U.S. Bureau of the Census, *1971 Statistical Abstract*, table No. 924, p. 573.
21. Brown, A. W. A., 1968. "Insecticide Resistance Comes of Age." *Bulletin of the Entomological Society of America*, 14: 3–9; U.S. Department of Agriculture, Symposium on Economic Research on Pesticides for Policy Decision Making, April, 1970, speech by C. H. Hoffman. Also see the Council on Environmental Quality, *Integrated Pest Management*, 1972 (forthcoming).
22. Food and Agriculture Organization of the United Nations (1968). *The State of Food and Agriculture*, Rome, Italy, p. 205.
23. National Commission on Materials Policy, *Towards a National Materials Policy* (1972).
24. *Id.*, p. 3.
25. *Environmental Protection*, February 8, 1972, House of Representatives Document No. 92–247, p. 6.
26. American Paper Institute, *Statistics of Paper* (1964, Supp. 1970).
27. Communication from EPA.
28. H. G. Wells, *Anticipations* (1902), p. 208.
29. J. B. S. Haldane, *Callinicus: A Defense of Chemical Warfare* (1925).
30. Robert Ayres, *Technological Forecasting* (1969), p. 12. The Wells and Haldane examples are also from this source.
31. Meadows, et al., *supra* note 6 at p. 43.
32. United Nations, *Growth of World Industry, VII.*
33. U.S. GNP increase was $72.7 billion (*Economic Report of the President* (1972), p. 195); 1970 GNP for Africa was $61.9 billion. (Office of Statistics and Reports, USAID, Reports Control No. 137 (April 1, 1972), p. 1.)
34. D. G. Dalrymple, *Survey of Multiple Cropping in Less Developed Nations*, USDA, Foreign Economic Development Service, 56–59 (October 1971).
35. National Goals Research Staff, *supra* note 1 at p. 36.

WILDLIFE

3 international aspects of environmental quality

According to a Swedish report presented to the United Nations Conference on the Human Environment in June, most of the sulfur emissions from Swedish industries are carried abroad, while Sweden's rivers, forests, and property are being damaged by "acid rains" from the sulfur emissions of British, German and other nations' industries Two months before, the United States and Canada agreed on a wide range of actions to control pollution of the Great Lakes, which span their common border. Earlier, in February, 12 European nations signed the Oslo Convention, aimed at curbing ocean dumping in the Northeast Atlantic and the North Sea. These recent events well illustrate that many environmental problems override international borders, that pollution from one country may affect another, and that the collective pollution from many nations may jeopardize important common resources such as the oceans and the atmosphere. Extended discussions at the U.N. conference vividly pointed out that a nation's domestic pollution cleanup program may affect international commerce and that pollution control measures may alter the demand for natural resources domestically and internationally.

This chapter is divided into four sections. The first reviews significant international activities of the past year. The second discusses pollution of the oceans—a major pollution issue of international scope. The third section analyzes environmental standards and their effects on national economies and international trade. The last section addresses a number of wildlife issues of international interest.

major developments of the past year

The past year was a landmark year for international cooperation in attacking environmental problems. The Stockholm conference was the first meeting of almost all of the world's nations—both developed and developing—to agree on common principles and to establish international mechanisms for global environmental improvement. In addition to its major role in the conference, the United States pushed ahead with two major bilateral environmental agreements—with Canada and with the Soviet Union. This section highlights these and several other key international accomplishments of the past year.

the u.n. conference on the human environment

At the June 5–16, 1972, U.N. Conference in Stockholm, representatives of 113 nations—encompassing most of the world's people—joined in meetings that mirrored the complexities of winning worldwide consensus on all aspects of environmental protection. More important, the conference produced some concrete first steps in institutionalizing international concerns and in coming to grips with several major substantive issues of worldwide concern. It achieved nearly every goal established for it in the preparatory papers and meetings, including almost all the U.S. proposals. The U.S. delegation, led by Russell E. Train, Chairman of the Council on Environmental Quality, included delegates from the executive branch, the Congress, the States, and the private sector. The conference agreed on the following major points:

- *A new permanent organization will be established within the United Nations to coordinate international environmental activities.* The new Environmental Secretariat will be headed by an Executive Director with a small staff of about 30 to 50 persons. It will be supported by a Governing Council, composed of representatives of 54 nations, which will report to the General Assembly through the Economic and Social Council (UNESCO).
- *A U.N. environmental fund, financed by voluntary contributions from member governments, will be established.* This fund was initially proposed by President Nixon in his Environmental Message to the Congress on February 8, 1972. It will be used to finance the major projects of the new U.N. Environmental Secretariat, such as the worldwide monitoring network approved by the conference. The initial goal for the fund is $100 million over the first 5 years. The United States is prepared to commit $40 million over this period on a matching basis, subject to Congressional appropriation. Other countries have already indicated that they will also contribute to the fund.

- *The conference endorsed completion of a convention to control ocean dumping of shore-generated wastes.* Such a convention was called for by President Nixon in his 1971 Environmental Message and when he submitted domestic ocean dumping legislation to the Congress. The conference agreed to refer the draft prepared in April and May of this year to the U.N. Seabed Committee July–August session for information and comment. It also called upon interested governments to convene a conference before November 1972 to negotiate a convention for signature before the end of the year. This conference would be convened by the United Kingdom in consultation with the Secretary General of the United Nations.
- *The conference urged that the International Whaling Commission (IWC) adopt a 10-year moratorium on commercial whaling. The conference also recommended that the IWC be strengthened and that international research efforts be increased.* This moratorium was rejected by a 6-to-4 vote (with four abstentions) by the IWC at its meeting in London on June 26–30. The United States, which had proposed the moratorium, cast one of the four favorable votes. Although the moratorium was rejected, the Stockholm recommendation and the firm U.S. position made it possible to secure significant reductions in quotas and improvements in the IWC and its procedures.
- *The conference approved the Earthwatch Program—a coordinated plan to use and expand existing monitoring systems to measure pollution levels around the world and their effects on climate.* As part of this program, a network of 110 monitoring stations will be set up throughout the world under the auspices of the U.N. World Meteorological Organization (WMO). The network will monitor changes in the earth's climate and will chart levels of air pollution. It will include 10 "baseline" stations in remote areas to contrast the air quality there and in developed areas. The Earthwatch Program also includes plans to monitor the oceans, radioactive wastes, food contamination, and changes in the numbers of plants and animals which might indicate hazardous conditions in the environment.
- *The conference endorsed proposals for conservation conventions:*
  - *The World Heritage Trust Convention* was proposed by President Nixon in his Environmental Message of February 8, 1971. It is based on the concept that some areas of the world are of such unique natural, historical, or cultural value that they are part of the heritage of all mankind and should be given special recognition and protection. The Stockholm conference endorsed the draft convention developed under UNESCO auspices and invited governments to complete work on it "with a view to adoption" at the next general session of UNESCO to be held in Paris this fall.

- *The Endangered Species Convention* is designed to protect species of plants and animals threatened with extinction. It would impose strict controls on the export, import, and transnational shipment of endangered species. It was endorsed in principle by the conference, with the recommendation that an international conference be held as soon as possible to adopt a convention.

- *The conference adopted a 26-point declaration of environmental principles calling for commitments by countries to deal with environmental problems of international significance.* An example is Principle 21, which declares that states have "the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states or areas beyond the limits of national jurisdiction."
- *The conference adopted a recommendation calling for compensation by the developed countries to the less-developed countries for trade damages stemming from environmental factors.* The United States voted against this proposal, pointing out that many forces affect export earnings and that to single out any of these, such as environmental actions, for compensatory treatment is wrong in principle and would create a disincentive for environmental improvement.

Although most of the Stockholm recommendations require further action by the U.N. General Assembly, the proposed U.N. Environmental Secretariat, or other international bodies, the conference for the first time provided a forum for almost all the nations of the world to deal with a broad range of environmental problems. Considering the diversity of goals, political systems, and stages of development of the nations at the conference, the success in reaching consensus on so many issues was significant.

oecd guidelines

Recognizing that environmental measures can have important economic implications, the Organization for Economic Cooperation and Development (OECD)—composed of Japan, Australia, and the industrialized nations of Western Europe and North America—asked the Environment Committee that it formed in 1970 to suggest ways to minimize the impacts of environmental protection measures on international trade. Based on committee recommendations, the OECD Council at its ministerial meeting in May 1972 adopted a set of guiding principles on the international economic aspects of environmental policies. These principles, reprinted as Appendix 1 to this chapter, follow the general recommendations made in July 1971 by the President's Commission on International Trade and Investment Policy.[1]

The OECD guidelines espouse the "polluter pays" principle, which states that the cost of pollution controls should be reflected in the costs of making products the use or production of which causes pollution. Under this principle some portion of the environmental protection cost is ultimately borne by the consumer of the product. The guidelines also include another important principle—that governments should frame their environmental protection measures in a way that avoids creating nontariff barriers to trade. The guidelines further urge harmonization of national environmental standards when reasons for differences do not exist—an issue that is explored later in this chapter.

imco's efforts to control pollution from ships

The Intergovernmental Maritime Consultative Organization (IMCO), a U.N. specialized agency, is the primary institution through which the maritime nations reach agreement on controlling pollution from ships. It has continued its efforts to prevent and reduce oil pollution from tanker collisions, groundings, and intentional discharges of oily ballast and bilge water. In October 1971, IMCO adopted standards to reduce oil outflow from tanks ruptured in vessel casualties. In May 1972, the President submitted to the Senate for its advice and consent convention provisions to implement these standards.[2]

In December 1971, the United States and a number of other nations agreed to compensate victims damaged by oil spills by establishing a compensation fund supported by contributions from oil cargo receivers.[3] This convention was also developed by IMCO.

In October 1971, IMCO resolved to make the complete elimination of international pollution from oil and noxious substances and the minimization of accidental spills the main objectives of its 1973 Conference on Marine Pollution. Through IMCO's Subcommittee on Marine Pollution, the United States is helping to develop a new international convention to replace the 1954 Convention for the Prevention of Pollution of the Sea by Oil.[4] The new convention's goal will be to eliminate intentional discharges of oil and hazardous substances from ships by 1975, if possible, or at the latest, by the end of the decade. This goal was first proposed by the United States at a meeting of NATO's Committee on the Challenges of Modern Society in late 1970.

committee on the challenges of modern society (ccms)

The North Atlantic Treaty Organization's CCMS, established in 1969 at the President's recommendation, has extended its multilateral "pilot project" approach to a number of environmental programs. In the field of air quality, for example, with the United States as the pilot country, CCMS adopted a resolution for NATO nations to use a systems approach to develop air quality management programs. In addition, it has published air quality criteria documents for sulfur oxides and particulates and plans to publish additional documents on carbon monoxide, nitrogen oxides, and photochemical oxidants. This is the first time an international body has been able to agree on publication of such criteria. The committee is planning a second international conference on advanced low-pollution engines for motor vehicles.

In the field of water quality, a Canadian-led project is developing a model approach to dealing with water quality in an interjurisdictional setting. Using the St. John's River Basin on the U.S.-Canadian border between Maine and New Brunswick, the project will establish a cooperative program involving Provincial, State, and local governments. A conference on the problems of cooperation in an international river basin will be held this fall in Maine. A British-led project on advanced sewage treatment has been built around a demonstration plant using the advanced physical-chemical treatment process. Germany and France are undertaking a similar program employing the pure oxygen process. In addition, a program is underway to model pollution in the North Sea in connection with the CCMS ocean pollution project. Led by Belgium, the project is also overseeing implementation of its goal of ending deliberate oil discharges by the end of the decade. This was the goal adopted as the basis for a convention being prepared by IMCO.

CCMS is expanding its environmental efforts beyond pollution control. For example, a French-led project is examining various approaches to land use planning as it relates to environmental quality, with recommendations expected at the end of this year. And the Committee is considering the possible establishment of an International Cities Institute to deal with common urban problems on a systems basis.

u.s. bilateral actions

The United States entered into two unprecedented bilateral agreements in 1972. An agreement with Canada to restore and protect the Great Lakes and an agreement with the Soviet Union on a broad range of environmental concerns. In addition, the United States recently agreed with Mexico to take new steps to protect the quality of the water in the Colorado River as it flows from the United States into Mexico.

united states-canadian great lakes water quality agreement—The United States-Canadian Great Lakes Water Quality Agreement,[5] signed by President Nixon and Prime Minister Trudeau on April 15, 1972, in Ottawa was a major bilateral action to address a common environmental problem.

Pollution of the Great Lakes, especially Lake Erie, has been a matter of intense United States and Canadian concern. The lakes are not just a critical natural resource but are also a center of commercial and industrial activity for both nations. Because the international boundary passes through four of the five lakes and through the three connecting channels, pollution of these waters cannot be abated successfully except by cooperative action.

The basic U.S.-Canadian agreement on the Great Lakes is articulated in the Boundary Waters Treaty approved by the U.S. Senate in 1909.[6] In 1964, the two governments asked the International Joint

Commission (IJC), a joint U.S.-Canadian organization established under the 1909 Treaty, to investigate and report on the condition of the waters in Lake Erie, Lake Ontario, and the international section of the St. Lawrence River and to recommend actions to improve water quality. The IJC submitted its final report to the governments in 1970, urging specific joint action. The report and its recommendations were reviewed by a U.S.-Canadian joint working group composed of Federal, State, and Provincial agency representatives. It reported its conclusions to a ministerial level meeting in Washington on June 10, 1971. The United States and Canada then negotiated and concluded the agreement.

The agreement calls on the United States and Canada to adopt both general and specific water-quality objectives. The general objectives are described in terms of five freedoms: freedom from toxic substances; freedom from nutrients in quantities which stimulate growth of unsightly weeds and algae (accelerated eutrophication); freedom from oil, floating debris, scum and other floating materials; freedom from material producing odor, color, or other nuisance conditions; and freedom from objectionable sludge deposits.

The agreement prescribes as specific objectives maximum ambient concentrations for specific pollutants and maximum loadings for phosphorous. U.S. and Canadian water quality standards and regulatory requirements must conform to these objectives, which in some cases are stricter than existing Federal-State water-quality standards. The IJC is charged with monitoring both U.S. and Canadian progress in fulfilling the goals of the agreement.

The two governments agreed that by December 31, 1975, certain programs and measures either will have been completed or will be in process. However, control of pollution in the Great Lakes will be a continuing demand on both nations long after that. New programs will be implemented and old ones revised as necessary.

The cost of preventing and cleaning up pollution in the Great Lakes is influenced by increasing population, industrial growth, intensified agriculture, and many other factors. Accordingly, no one sum may be given as the cost to clean up the lakes. The United States will furnish funds to construct municipal waste treatment plants and to help finance State water pollution control programs on the Great Lakes. This year approximately $400 million of Federal, State, and local funding will be provided for the Great Lakes treatment program. New water pollution legislation, now being considered by the Congress, would permit expanded construction and a more intensified enforcement program.

the environmental protection agreement between the united states and the soviet union—On May 23, 1972, President Nixon and President Podgorny signed an agreement on environmental matters[7] that is significant both environmentally and politically. The agreement not only is a potential model of how two nations can work together to understand and protect the environment, but it also strengthens cooperative efforts between two of the world's great powers.

The two countries have agreed to work together in 11 problem areas ranging from air and water pollution and the urban environment to the influence of environmental change on climate, earthquake prediction, and arctic and subarctic ecological systems. The scope of the agreement reflects the fact that the United States and the Soviet Union, both industrial nations with large and diverse land areas, experience almost every type of environmental problem. It goes far beyond past arrangements between the United States and Russia for exchanging visits and research information. It calls explicitly for joint action programs and active cooperation on specific projects.

Although early efforts will focus on the 11 specific areas, the agreement envisions great flexibility in extending programs to other areas. The long-term nature of environmental problems is reflected in the 5-year term of the agreement, which will continue to be extended for successive 5-year periods unless one party wishes to stop. The full text of the agreement is reproduced as Appendix 2 of this chapter.

united states-mexican communique on salinity—In a further move toward environmental accord with an immediate neighbor, the United States has initiated new steps to deal with Colorado River salinity that Mexico has determined damages agriculture in its Mexicali Valley. In a joint communiqué issued on June 17, 1972, with visiting Mexican President Echeverria, President Nixon announced that the United States will take several immediate measures to reduce salinity and that he will appoint a special representative to investigate the entire problem in order to propose by the end of 1972 a definitive solution for the approval of the U.S. Government.[8]

In the 1944 Mexican Water Treaty,[9] the United States agreed to deliver annually 1.5 million acre-feet of Colorado River water, which might come "from any and all sources," without mention of quality. However, after the Wellton-Mohawk Irrigation and Drainage District began a pumped drainage operation in 1961 in southwestern Arizona, Mexican farmers complained of an increase in the concentration of salts, the Mexican Government contending that the water was too saline to be acceptable under the Treaty and was contaminated contrary to international law. The United States took measures at once to reduce the salinity. In a 1965 agreement with Mexico, the United States agreed to take further measures to upgrade the river's quality,[10] which was done at a cost of $12 million. However, the Mexican Government complained that despite the remedial measures taken, the salinity of the Colorado River in Mexico is still too high for proper agricultural use and that the disparity is too great between the quality of its water and that used by major water users in the United States near the border.

The June 1972 communiqué, in addition to dealing with the issue of Colorado River salinity, contained an agreement by the two Presidents to have policy-level officials from the United States and Mexico meet regularly to discuss other environmental problems of natural concern and methods for dealing with them more systematically.

pollution of the oceans

Many pollutants eventually end up in the world's oceans. They are carried there by the winds and wash in with rain or snow, and they flow from the rivers or outfalls which drain the land. The dumping of dredge spoils and other wastes in the oceans and discharges of oil and other hazardous substances from ships are further pathways that pollutants follow into the marine environment.

Sometimes no immediately visible problems arise from man's use of the oceans as a common dumping ground. Often the oceans seem capable of forever diluting and rendering harmless the wastes pouring into it. There is disturbing evidence, however, that the waters of the open ocean—and especially the biologically rich coastal waters and estuaries—are becoming more and more polluted.

At times marine pollution appears principally as a national problem, as when the coast of a particular country becomes polluted. At other times the problem is regional, as with the pollution of the Baltic, Black, Mediterranean, and North Seas. But in the final analysis, marine pollution is fundamentally an international concern. The seas play a vital role in maintaining the world's environment, making a home for a rich variety of life, contributing to the oxygen-carbon dioxide balance in the atmosphere, altering global climate, and providing the base for the world's hydrologic system. Marine resources are economically vital to man. And because they are used by mankind as a whole, national and international action to protect them becomes mandatory.

We do not know as much as we should about the dimensions and severity of marine pollution. We do not fully understand the pathways of pollutants in the marine environment and the rate at which they are removed or assimilated. Further, we have only limited data on the harm caused by pollution, especially that resulting from long-term exposure to potentially harmful substances in small concentrations. For this reason, it is extremely important that much more research and monitoring be undertaken for accurately measuring the degree of marine pollution that we now have, to discover its routes, and to chart the long-term hazards inherent in current and even greater levels of pollution. At the same time, protective actions can and should be taken now. One of the principles outlined in the Declaration on the Human Environment, adopted at the U.N. Conference in Stockholm, deals with national responsibilities to prevent pollution of the oceans. It provides that:

> States shall take all possible steps to prevent pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.

marine pollution from the atmosphere

Many pollutants enter the seas by way of the atmosphere. It is estimated, for example, that more than 90 percent of the petroleum polluting the oceans each year comes not from tanker breakups or other disasters but from the vaporization of gasoline and other petroleum products ashore.[11] The washout of heavy metals and synthetic organic chemicals from the atmosphere is also important. Lead and DDT inputs into the marine environment from the atmosphere may be as large as or larger than inputs from rivers.[12]

Pollutants can persist in the atmosphere for varying lengths of time, and some drift over great distances. Sulphur dioxide, for example, has an average lifetime of 2 or 3 days in the atmosphere before dropping out in precipitation. There is evidence that during this period it can travel hundreds of miles from its original source. Nitrogen oxides, water vapor, and particulate matter discharged into the stratosphere by high-flying aircraft can stay aloft for at least a year and can be dispersed over great distances.[13]

Although marine pollution is an international problem, the first line of defense is national. There are no international mechanisms for controlling air pollution from individual countries, and it seems unlikely that such mechanisms are forthcoming in the near future. Existing international organizations have no enforcement powers. They can merely encourage member nations to develop their own air quality standards to curb the pollutants that they discharge into the air. This situation argues for strong national legislation, standard setting, and enforcement—with international effects taken into consideration. Otherwise, marine pollution from all sources, including the atmosphere, will continue to worsen in the years ahead.

pollution from rivers

Pollution from rivers—from municipalities, industries, and land runoff—is the principal route by which most pollutants reach the oceans. River banks are the site of heavy industrial and municipal concentrations whose effluents often are insufficiently treated before they are discharged. Land runoff pours nutrients, pesticides, and organic wastes into the rivers, which eventually flow into the oceans. There the pollutants that they carry are joined by pollutants from other rivers and ocean outfalls.

As in the case of pollution from atmospheric sources, pollution from land runoff is essentially a problem to be solved at the national level. Some countries already have taken important actions to clean up their rivers. These actions benefit estuaries, coastal regions, and the open sea. The United States, for example, has Federal-State water quality standards, which are enforced by regulating industrial and municipal effluents. Funds are made available to localities to build sewage treatment facilities. Comprehensive new water quality legislation remains to be hammered out in a Congressional conference committee.[14]

A dramatic example of a new national effort can be seen in Britain, where a massive campaign to fight water pollution was announced early this year. Britain will spend some $3.8 billion over the next 5 years—nearly 50 percent more than it spent during the last 5 years—to clean up over 2,000 miles of seriously polluted rivers.

CCMS has launched river basin studies,[15] and other international organizations, such as the U.N. Economic Commission for Europe (ECE) are seeking ways to reduce water pollution within Eastern and Western Europe. OECD has agreed to undertake a pilot study of coastal degradation and pollution in the Mediterranean. On the national level, many governments have plans to clean up their rivers with better sewage treatment.

But marine pollution from rivers also lends itself to regional solutions. Certain areas—the Baltic, Black, and North Seas, for example—are seriously polluted and demand cooperation between nations whose rivers drain into them. The recently concluded agreement between the United States and Canada to clean up the waters of the Great Lakes furnishes a model for this kind of cooperation.

ocean dumping

The dumping of wastes at sea—dredge spoils, industrial wastes, sewage sludge, and solid wastes—is only a part of a broad problem of marine pollution. But it is one which requires national and international action before the practice gets out of hand. The United States has moved to curb marine pollution through domestic legislation to regulate ocean dumping of shore-generated wastes. The legislation has passed both the Senate and the House and has been reported out by a conference committee.[16]

The United States has also been working with other nations on an international convention to control ocean dumping. The convention would only allow dumping in accordance with a permit system adminitsered by national authorities.

The U.N. Conference at Stockholm urged a special meeting before November 1972 to ready the convention for signature by the end of the year. In the meantime, the Oslo Convention, an important regional convention signed in February 1972 by 12 European countries, will help to end dumping of hazardous wastes by ships and plans in the Northeast Atlantic and the North Sea.[17]

Ongoing efforts to achieve a worldwide ocean dumping convention illustrate the technical and political difficulties that may beset efforts to shape international environmental agreements. It has been difficult to reach agreement on which toxic substances should be banned altogether from dumping. There has also been disagreement on how to handle contaminants such as mercury, which may be present in trace amounts in dredge spoils and municipal wastes. At the present time, there is no international body with sufficient technical expertise to set tolerance levels for such trace pollutants or to oversee a system of dumping permits for materials that exceed agreed-upon tolerances. The United States has therefore proposed that a U.N. body, the Intergovernmental Maritime Consultative Organization, develop this kind of technical and administrative capability. Preliminary work in this area has been initiated by the Joint Group of Experts on the Scientific Aspects of Marine Pollution, a special organization affiliated with the United Nations.

pollution from ships

Shipboard discharges of oil, garbage, and other wastes into the seas is a growing problem. Oil is particularly vexing because a small amount spread over wide reaches of ocean may well cause serious environmental damage. Discharges from ships can also severely contaminate waters in ports, bays, and ship channels and along coasts. Thus, pollution from shipping is another problem with both international and national overtones and one for which international action is particularly crucial.

The recent work of the United States and other nations through IMCO to control pollution from ships was described in the first section of this Chapter. Another approach to marine pollution, adopted by Canada, is the unilateral establishment of a pollution control zone at sea. Canada has claimed a 100-mile zone of this kind in the area above 60° N. latitude, arguing that the Arctic region is in need of special protection from oil and other spills because the intense cold causes pollutants to persist for a long time. The United States has taken the position that such zones go well beyond the traditional breadth of the territorial sea, have no sanction in international law, and are not the best way to control ocean pollution effectively because they involve fragmented unilateral actions rather than internationally agreed upon arrangements. The issue of pollution-control zones will be a major item of interest for participants in the U.N. Law of the Sea Conference planned for 1973.

international uniformity of pollution control standards

The new water pollution-control legislation recently passed by the House of Representatives and the Senate [18] directs the President to pursue international agreements for uniform effluent standards for new facilities and for toxic and ocean discharges. This directive raises a broader question of potentially critical environmental, economic, and political consequences: To what extent should nations throughout the world make various pollution-control standards uniform? The question already has been debated vigorously within the Committee on the Environment of the OECD and in other international forums.

The first consideration is the extent to which uniform standards can be justified on an environmental protection basis. Air quality standards, for example, can be considered at two different levels—protection of health and protection of property, vegetation and aesthetic values, as is the case under the Clean Air Act in the United States.[19]

Except to the extent that people in various geographical areas may respond substantially differently to a particular ambient concentration of common pollutants because of variations in altitude, climate, and the like, uniform minimum air quality standards to protect public health may have merit. In setting standards to protect property, vegetation and aesthetics, however, each country will tend to weigh its social, political, and economic values much more heavily in deciding the level of air quality compared to other national goals.

Water quality standards are based upon the designation of beneficial uses for specific bodies of water and portions thereof. The desired uses are likely to vary to some extent among nations. Water quality criteria—based on use designations—specify the concentrations that must be achieved (as in the case of dissolved oxygen) or must not be exceeded (as in the case of biochemical oxygen demand). Even within a nation, such as the United States, where there are many types of waterways and aquatic populations, the criteria to protect a particular use designation (e.g., fishing, domestic water supply, and swimming) vary with the pecularities of the water body. These factors apparently were recognized in the pending Senate and House water quality bills, which do not call for uniform international water quality standards.

The strongest argument for common air or water quality standards is made when pollution from one country crosses into another. Such standards need be uniform only in the sense that common objectives are agreed upon in order to protect one nation from pollution originating in another.

In both existing air quality legislation and pending water quality legislation at the Federal level in the United States, there are requirements for new facilities to meet minimum emission or effluent limits based on the performance of demonstrated technology.[20] These controls are independent of limits based on ambient air and water quality standards for various pollutants—frequently mandating higher levels of abatement than such standards would require. The rationale in both cases is that advanced pollution control technology can be most economically employed in new facilities in order to prevent future growth from degrading environmental quality. There may well be merit in such a technologically based control strategy for new facilities on an international basis. The actual level of technology might vary among nations according to such relevant factors as the rate, nature, and concentration of growth.

It does not make sense from an environmental standpoint, however, to demand the same degree of emission control internationally on all new automobiles. For example, some nations do not need standards as stiff as the United States with its large and concentrated automobile and urban populations.

Toxic pollutants in both air and water are sufficiently dangerous to health and environment in almost any quantities to warrant controls that prevent or at least minimize their release into the environment rather than setting a tolerable ambient concentration in air or water. Thus, like new facilities, toxic emisisons and effluents appear amenable to uniform international standards. Similarly, all discharges into the oceans—shared resources for all mankind—ought logically to be governed by uniformly accepted principles and criteria. This approach has been adopted by the United States in seeking an international convention on ocean dumping.[21]

In the case of pesticides, the desirability of uniform standards hinges largely on the type of pesticide under consideration. Persistent pesticides such as DDT and other chlorinated hydrocarbons can have effects throughout the world. Because of their long life and nondegradability, these pesticides tend to accumulate in the oceans and in animal and plant life, where their concentrations are magnified. In view of their widespread impact, it appears that persistent pesticide use should be confined to health protection or other essential uses for which no feasible alternative is available. With nonpersistent pesticides, different ecological systems, food chains, application practices, and other factors probably warrant substantial latitude for controls among different nations. The use of such pesticides particularly involves a weighing of benefits and risks, such as the prevalence or absence of a pest-carried disease problem (malaria, for instance) and the need to assure an adequate food supply.

As shown, many factors must be considered in assessing the desirability—scientifically and environmentally—of international as compared to national controls over pollution. Even when uniform international environmental protection standards can be justified on purely scientific grounds, there are substantial social and political constraints. Individual countries differ tremendously in their priorities, stage of economic and technological development, and cultural values. Although it would be shortsighted for any nation to pursue industrial development and ignore the inevitable side effects of pollution, the exact degree of environmental controls will vary from one nation to another. The factors that will decide this include the nation's stage of economic development, its need for industrial expansion, and its difficulty in attracting industries.

A nation with an extremely low standard of living and the need to build a strong industrial and commercial base may be more tolerant of environmental abuses than a more highly developed nation. Moreover, nations with relatively limited resources may decide that basic health care services or education, and not the environment, has the highest priority.

To some extent, a less-developed country might seek to justify becoming a pollution haven because it desperately needs the jobs that foreign investment would bring. It might set low environmental standards designed to attract industrial investment. It might further argue that setting weak standards is fully within its prerogatives as a sovereign nation and that so long as its pollution does not cross national frontiers or unduly contaminate global air and water resources, its actions are beyond reproach. But in the long term, it is doubtful that such a country's overall economic development would be helped. While the immediate economic benefits of unregulated industrialization could temporarily speed its development, the heavy social cost in increased diseases, mortality, and degradation of resources could slow down development over the long run. If development continued unchecked, it would be only a matter of time before a less-developed nation became so polluted that it would be forced to adopt, however belatedly, environmental measures similar to those of developed nations. But by then, irreparable physical, social, and economic harm might already have been done. Firms in such countries that developed markets based on production without pollution control might have trouble adapting to new standards. Such transitional problems could hamper development further.

The environmental and economic hazards of a nation's adopting lax pollution control standards are real, but they do not necessarily lead to the conclusion that uniform standards are needed. International uniformity of pollution control standards has the most validity in certain areas—toxic pollutants, persistent pesticides, controls on new facilities. Uniform air quality standards to protect health may also have merit.

But it may be much more useful and feasible to concentrate primarily on the development of uniform—and more important, comprehensive—international criteria for environmental protection standards. Such criteria would assimilate the best available scientific data on the environmental and health dangers of various pollutants at different levels of concentration in the environment. The World Health Organization and CCMS have already done work to develop and publish such criteria.

International criteria, along with informational guidelines on available control technologies and their performances, could serve as the basic underpinning for appropriate standards in individual nations. And if some form of international standards were deemed desirable at a future time, the criteria would provide a scientific basis for their development.

international economic effects of environmental controls

Practically all measures to maintain and improve the environment have an economic impact. There are a number of specific issues that bear directly on international trade and investment and that, unless resolved satisfactorily, could damage international economic relations and set back efforts to improve the environment. The issues include how to prevent pollution controls and their costs from distort-ing international trade, what policy to adopt toward the movement of capital investment to pollution havens, how to reconcile real and imagined conflicts between environmental imperatives and economic development, and how to avoid damaging the export markets of less-developed countries (LDC's) with environmental programs of developed countries.

effects on trade

Some industrialists worry that firms subject to strict environmental standards will be put at a competitive disadvantage with foreign competitors that are not. There is a corresponding concern that nontariff barriers, such as frontier charges and export subsidies, may be established by nations with high environmental standards to equalize environmental costs with trade competitors. Such action could trigger a series of retaliatory trade actions. Further consideration of this problem may be found in the 1971 report to the President by the Commission on International Trade and Investment Policy.[22]

The United States is hopeful that the guiding principles agreed to in the OECD, which seek to harmonize to the extent practical the environmental policies and practices of member countries, will help avoid or minimize such trade problems.

A significant element of the guidelines is the "polluter pays" principle, which provides that the cost of pollution controls should be reflected in the costs of goods the use or production of which cause pollution and should not be financed by subsidies. The guidelines permit certain exceptions to the "polluter pays" principle, particularly for transitional periods, provided that they do not lead to significant distortions in international trade and investment. Adherence to this principle will both contribute to a more efficient allocation of productive resources and, by promoting uniform practices for the financing of pollution-control costs, help avoid trade distortions.

The OECD guidelines also address international differences in environmental standards, discussed earlier in this chapter. They recognize that even if all nations follow the "polluter pays" principle, international trade distortions may be caused by widely disparate standards, especially if some countries become pollution havens—setting inadequate environmental standards in order to attract industrial investment or to gain a competitive advantage for their export industries. While recognizing that in many cases valid reasons exist for differences among national environmental standards, the OECD guidelines recommend that whenever appropriate, governments should harmonize national environmental policies. They also urge worldwide movement toward effective standards. The guidelines suggest that harmonization among nations of the timing and general scope of regulations for specific industries is particularly appropriate from the standpoint of preventing trade distortions.

The Environment Committee of the OECD is now working on a notification and consultation procedure for member governments to use in consulting with each other on their observance of the guiding principles. Information that American firms can supply the U.S. Government regarding foreign environmental standards and policies will be useful in such considerations involving our Government.

It is too early to evaluate how successful these OECD measures will be in minimizing distortions of international trade. Although member nations of the OECD have agreed in principle to follow the "polluter pays" philosophy and to consult with other governments in standard setting, putting these concepts into practice will not be easy. The logistics of international consultation will often be complicated by domestic demands and legislative requirements. Some firms may seek exceptions to the "polluter pays" rule and pressure their governments to relax the rule for them. Although a certain flexibility in administering the "polluter pays" principle is necessary, leniency in interpretation and numerous exceptions will defeat its purposes.

effects on development

The economic implications of environmental controls are of particular interest and concern to the less-developed countries. The LDC's are mainly worried that their economies will be adversely affected in two respects: higher development costs caused by environmental safeguards imposed by donor nations for specific aid projects and programs and reduced exports of materials for which world demand may be reduced by domestic environmental controls adopted by developed nations. There were sharp discussions of these issues in preparatory meetings for the Stockholm Conference on the Human Environment, and the subject was in the forefront of LDC thinking at the conference.

Over the opposition of almost all aid-donor countries, the LDC's won approval at Stockholm of a recommendation calling for an increase in assistance "adequate to meet the additional environmental requirements" of developed countries. The main basis for the U.S. vote against this recommendation was that there is no rationale for singling out environmental protection costs from among others for special accounting in giving aid. At U.S. initiative, the Development Advisory Committee of the OECD has begun discussions aimed at coordinating donor nation policies on the environmental ramifications of development aid to the LDC's.

Developing nations that depend mainly on exports of primary resources are concerned that the demand for such resources will be reduced as a result of actions by developed countries to safeguard the environment. Thus, LDC's that produce lead and sulfur, for example, fear that as lead is phased out of gasolines and paints and as sulfur is recovered from coal and oil desulphurization processes and from the stack gas removal of sulfur oxides, the worldwide demand for these materials will decline.

If recovery and recycling of waste materials become more widespread in industrialized countries, developing countries are afraid that the rate of growth in the use of many natural resources, including iron ore, timber, and bauxite, will slow down. To meet this problem, developing countries believe that the developed countries should be prepared to pay "compensation" to cover any decline in export earnings that is caused by actions taken in the developed countries to protect the environment. A recommendation to this effect was also adopted at the U.N. conference.

The United States voted against this proposal because as a matter of principle it opposes compensating countries for declines in their export earnings for whatever cause and believes that a commitment to pay such compensation would serve as a disincentive to environmental controls. However, the United States made it very clear that it will take all practical steps in carrying out environmental programs to prevent reduced access to our markets and will not use environmental concerns as a pretext for discriminatory trade policies. The United States also said that it was fully prepared to deal with any claim that U.S. environmental actions violated its General Agreement on Tariffs and Trade (GATT) obligations in accordance with established GATT procedures.

conservation of natural resources

Although the international aspects of marine pollution are very clear, conservation is often thought of primarily in a limited national sense—such as preserving animals and their habitats in a particular country. However, conservation has a broader meaning. For example, some ocean resources, such as whales, are international in nature. Certain animal species such as spotted cats or natural areas such as the Serengeti Plains of East Africa, found in individual nations, are resources of interest to all mankind.

Conservation is not merely a concern of the upper and middle classes in developed countries—it can either foster or hinder both the long-term plans of the LDC's for overall development and a favorable balance of payments. Tourism from abroad is a major earner of foreign exchange and occupies an important position in the economies of some LDC's. Wild animals in their natural settings are often a focal point of tourism.

animals of special concern

whales—Marine mammals, including whales, dolphins, seals, and polar bears, are increasingly endangered by man's onslaughts. Of these mammals, some species of whales are probably in the greatest jeopardy.

Technological developments over the years—such as ships powered by engines instead of the wind, the invention of the explosive harpoon gun, and the later development of fast killer ships, huge factory ships, radar and sonar, and helicopters—all combined to increase the efficiency of whale killing greatly.

The effect on whale stocks of this accelerated killing was predictable. In the peak year of 1930, almost 30,000 blue whales were killed, out of a total population estimated at 100,000.[23] By 1964, when the International Whaling Commission (IWC) prohibited further taking of blue whales by member nations, less than 5 percent of their original estimated population of 200,000 was left. Along with the blue whale, four other species—right, bowhead, humpback, and gray—have also been overharvested, and their harvest has also been banned. Some stocks of four other species of large whales—fin, sei, sperm, and Bryde's—are significantly depleted but are still harvested. The population of the fin whale is severely reduced from its estimated original size. Commercial harvesting of whales is actually no longer necessary in view of the fact that there are now substitute raw materials for virtually all products fabricated from whales. Soap, margarine, cosmetics, machine oil, transmission fluid, fertilizer, food, and pet food—for which whale products are used—can easily be made from other substances. However, some countries still rely rather heavily on whale meat for human food.

Because of the increased national concern for the protection of whales, in 1971 the Senate and House of Representatives both passed resolutions calling for a 10-year moratorium on the killing of all whales.[24] On December 2, 1970, the Secretary of the Interior put eight species of commercially hunted whales on the Endangered Species list.[25] This action banned the import of whale products as of December 1971, thus removing about 20 percent of the world's demand for such products. The last remaining U.S. whaling operation was terminated as of December 1971, when the Secretary of Commerce announced that no further licenses for commercial whaling by U.S. citizens would be granted.

Similar efforts to save whales have not been undertaken by either Japan or the Soviet Union, which in the 1969–70 season together accounted for 85 percent of the 42,000 whales killed.[26] The main international organization concerned with whaling—the IWC—has not taken effective action in the past to halt the precipitous decline in whale populations.

Today some species stand on the edge of extinction. The IWC's approach to protecting endangered whales has been to try to manage them, on a sustained-yield basis, by setting quotas on takings low enough to permit depleted populations to recover. However, the limits set at the June 1971 IWC meeting were unsatisfactorily high. And although it was agreed that international observers would accompany whaling fleets beginning with 1971–72 Antarctic season, the Russian and Japanese fleets sailed without any observers.

The United States has advocated a 10-year moratorium on all whaling, both to let presently depleted stocks recover and to generate needed scientific data on whales. The U.N. Conference on the

Human Environment endorsed this proposal, calling upon the IWC to implement it. While pressing for the moratorium, the United States also strengthened its participation in the IWC. In April 1972, the President appointed the Chairman of the Council on Environmental Quality as his special representative to the IWC and urged other governments to take steps to buttress the works of the Commission.

At the IWC meeting in June 1972, the Commission rejected the proposed moratorium by a 6-to-4 vote, with four abstentions. However, it agreed to significant reductions, from 8 to 38 percent, in the 1973 quotas for catches of fin, sei, and sperm whales in the North Pacific and Antarctic Oceans. It also extended the current ban on hunting humpback and blue whales. Other seriously threatened whales—the bowhead, right, and gray whales—continue to receive protection as well. For the first time, the IWC agreed to set quotas by individual species, stocks, and in some cases, by sex, to permit management tailored to specific problems. Further, the Commission agreed in principle to expand its $16,000 annual budget to about $100,000 and to initiate action for an International Decade of Whale Research. The Soviet Union and Japan agreed to allow international observers on their ships to check for compliance with quotas and other IWC regulations.

other marine mammals—Tuna fishermen have long known that dolphins and certain species of tuna often travel together, apparently in some kind of feeding association. When tuna were only taken by long lines or by poling, there was little danger that dolphins would be caught inadvertently. But in the last decade, tuna fishermen have turned to using huge purse seine nets. Although these nets do catch more tuna, in tuna fishing by U.S. fishermen in the Pacific, it is estimated that from 100,000 to 900,000 porpoises are accidentally drowned each year when trapped in tuna nets. In addition, some countries, notably Japan, hunt dolphins and porpoises commercially, principally for human consumption. The result has been a marked reduction in the number of porpoise schools, and some types of porpoise may soon face severe depletion unless they are protected. Although no solution to this problem has been developed to date, efforts are now underway to perfect new fishing methods, including new types of tuna nets which will kill fewer dolphins.

An estimated 10,000 to 20,000 polar bears now live in the Arctic region.[27] The extent of recent hunting—estimated at about 1,300 animals in 1969[28]—has caused concern that annual kills may be too high. Because these bears live part of the time on pack ice which is on the high seas, their conservation requires international agreement among the five governments on whose land or waters polar bears are found: Canada, Denmark, Norway, the United States, and the Soviet Union. The Soviet Union has banned sport hunting of polar bears for some years, both on its soil and on the high seas, and some limited regulations to protect polar bears domestically are already in effect in the other four countries. But international agreement is necessary to fully protect bears on the high seas.

In the fall of 1971, the United States sounded out the four other governments on the possibility of negotiating a convention to conserve polar bears. It was hoped that this could be done in time for signature at the June 1972 U.N. conference. But the effort was delayed because of the claim by some of these countries that more scientific data on polar bears must first be collected. New information has been developed and made available to governments by the International Union for Conservation of Nature and Natural Resources. Based on this information, a polar bear convention may be developed by these five nations in the coming year.

Existing international law does not protect or regulate wildlife on the Antarctic high seas or on the pack ice. Consequently, this area is open to sealing by any nation. The Norwegians took about 1,000 seals there in 1964,[29] and they and several other nations are reportedly considering commercial operations in 1973. The United States has taken the lead in developing a convention to protect Antarctic seals at a conference in London in February 1972, and it was signed by the United States and other nations in June.[30]

The convention completely protects three species of seals, sets low limits on three others, and establishes closed seasons and bans harvesting in certain areas. While the convention allows harvest of some seals in the Antarctic, it establishes conservation measures where none now exists.

spotted cats—The United States has also moved to protect another threatened group of animals—spotted cats. The continued killing of these cats for their fur led the Secretary of the Interior in March 1972 to place several additional species of spotted cats that are threatened with worldwide extinction on the Endangered Species List.[31] These cats, their parts, or products made from them are allowed into the United States only for scientific, zoological, and related purposes. The animals involved are the cheetah, ocelot, margay, tiger cat, leopard, tiger, snow leopard, and jaguar.

By effectively removing sales of furs made from these creatures from the American market, the economic incentive to hunt them is greatly reduced.

endangered species convention

The United States and many other nations are working to set up a meeting to draft an Endangered Species Convention to protect plant and animal species threatened with extinction. The Convention, endorsed at the Stockholm conference, will impose strict control on the export, import, and transnational shipment of these species. It will both correct the present overexploitation of endangered species and prevent other plants and animals from being decimated to the point at which they are officially considered to be endangered.

world heritage trust

In his 1971 Environmental Message,[32] President Nixon indicated that it would be fitting for all nations to agree to the principle that some areas of the world are of such unique natural, historical, or cultural value that they are part of the heritage of all mankind and should be accorded special recognition and protection as part of a World Heritage Trust. Such an arrangement would not impose limits on national sovereignty but would extend international recognition to areas that qualify. Technical assistance would be made available to protect and manage such areas.

A final draft of a convention for a World Heritage Trust, embodying the President's proposals, was completed by a group of experts at a UNESCO meeting in April 1972 and was endorsed at the U.N. conference. It will be ready for signature at UNESCO's General Conference in Paris in late 1972.

The Convention will lend much needed protection and management assistance for many of the outstanding areas of the world, which may be lost or irrevocably destroyed unless the world's nations take effective action. The Trust could include such natural areas as the Grand Canyon, the Serengeti Plains of East Africa, and the Galapagos Islands. Historic and cultural sites such as the pyramids, the Acropolis, Angkor Wat, and Stonehenge might also be included.

conservation of genetic resources

The widest possible diversity of and within species should be maintained for ecological stability of the biosphere and for use as natural resources. The survival of all species, including man, depends upon the diversity of existing gene pools. But man's exploitation of new areas is destroying or displacing many important genetic resources. For example, wild species and primitive domesticated plants are being lost, especially in areas of the developing world that traditionally have had large numbers of wild varieties. Because of the enormous range of species involved and the dimensions of monocultural agriculture, international action is called for to preserve the world's genetic resources. The Stockholm conference recommended that international programs be launched to preserve these resources, including establishment of a system of natural reserves to protect unique ecosystems.

conclusion

The first international conference on the global environment and major bilateral agreements involving the United States highlight the past year of unprecedented international activity to protect the environment. These and other accomplishments have built institutional foundations for future action. The new U.N. Environmental Secretariat and the mechanisms established in the U.S.-Canadian agreement on the Great Lakes, for example, should furnish the essential framework for the actions agreed to at Stockholm in June and in Ottawa last April. Similarly, the U.S. agreement with the Soviet Union outlines types of actions and a number of specific substantative areas for pooling the resources of these two world powers. And the Oslo convention on ocean dumping provides an important regional step toward the international convention that is needed.

There has been considerable discussion and action regarding the international economics of environmental protection measures. OECD has adopted guidelines for its industrialized member nations. They call for a "polluter pays" approach to financing environmental controls and for strengthening and maximizing appropriate harmonization of national standards, all to minimize distortions of trade relationships. The U.N. conference mirrored the desire of the LDC's that environmental requirements imposed on them or affecting their exports not impair their economic development or their international markets. The international economics of the environment is still a very live issue.

Despite the many still-unresolved environmental problems of international scope—such as ocean pollution and preservation of endangered species—the overall assessment of the past year is distinctly positive. The year's activities have brought the world much closer to the conventions and other international measures needed to deal with these problems. In the thorny areas of economics, there are obviously strong opposing viewpoints on how the overall costs and economic impacts of environmental protection should be borne, but there is little basic disagreement on the need to protect and restore the environment. The road toward global concern and concerted actions to make our environment more livable is a long one. The actions taken in the past year represent major strides. But with a host of conflicting economic pressures and the complexity and pervasiveness of the task of restoring the world's environment, success will require the diligence, patience, and tenacity of all nations.

footnotes

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9. Treaty with Mexico Relating to Utilization of the Waters of the Colorado and the Tiajuana Rivers and of the Rio Grande, Feb. 3, 1944, 59 Stat. 1219 (1945), T.S. No. 994.
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18. See note 14, *supra,* § 5; see § 7 of S. 2770 as passed by the House, 92d Cong., 2d Sess. (1972).
19. 42 U.S.C. § 1857, et seq.
20. *Id.,* § 1857c–6; S. 2770, *supra,* note 14, § 306.
21. "Report of the Intergovernmental Meeting on Ocean Dumping," adopted at London, England, May 31, 1972.
22. See note 1, *supra.*
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appendix 1

organization for economic co-operation and development—recommendation of the council on guiding principles concerning international economic aspects of environmental policies

Adopted by the Council at its 293rd meeting on 26th May, 1972

The Council,

Having regard to Article 5(b) of the Convention on the Organisation for Economic Co-operation and Development of 14th December, 1960;

Having regard to the Resolution of the Council of 22nd July, 1970 Establishing an Environment Committee [C(70)135];

Having regard to the Report by the Environment Committee on Guiding Principles Concerning the International Economic Aspects of Environmental Policies [C(72)69];

Having regard to the views expressed by interested committees;

Having regard to the Note by the Secretary-General [C(72)122 (Final)];

I. RECOMMENDS that the Governments of Member countries should, in determining environmental control polices and measures, observe the "Guiding Principles Concerning the Internationoal Economic Aspects of Environmental Policies" set forth in the Annex to this Recommendation.

II. INSTRUCTS the Environment Committee to review as it deems appropriate the implementation of this Recommendation.

III. INSTRUCTS the Environmental Committee to recommend as soon as possible the adoption of appropriate mechanisms for notification and/or consultation or some other appropriate form of action.

annex

guiding principles concerning the international economic aspects of environmental policies

Introduction

1. The guiding principles described below concern mainly the international aspects of environmental policies with particular reference to their economic and trade implications. These principles do not cover for instance, the particular problems which may arise during the transitional periods following the implementation of the principles, instruments for the implementation of the so-called "Polluter-Pays Principle", exceptions to this principle, trans-frontier pollution, or possible problems related to developing countries.

a. guiding principles

(a) *Cost Allocation: the Polluter-Pays Principle*

2. Environmental resources are in general limited and their use in production and consumption activities may lead to their deterioration. When the cost of this deterioration is not adequately taken into account in the price system, the market fails to reflect the scarcity of such resources both at the national and international levels. Public measures are thus necessary to reduce pollution and to reach a better allocation of resources by ensuring that prices of goods depending on the quality and/or quantity of environmental resources reflect more closely their relative scarcity and that economic agents concerned react accordingly.

3. In many circumstances, in order to ensure that the environment is in an acceptable state, the reduction of pollution beyond a certain level will not be practical or even necessary in view of the costs involved.

4. The principle to be used for allocating costs of pollution prevention and control measures to encourage rational use of scarce environmental resources and to avoid distortions in international trade and investment is the so-called "Polluter-Pays Principle". This Principle means that the polluter should bear the expenses of carrying out the above mentioned measures decided by public authorities to ensure that the environment is in an acceptable state. In other words, the cost of these measures should be reflected in the cost of goods and services which cause pollution in production and/or consumption. Such measures should not be accompanied by Subsidies that would create significant distortions in international trade and investment.

5. This Principle should be an objective of Member countries; however, there may be exceptions or special arrangements, particularly for the transitional periods, provided that they do not lead to significant distortions in international trade and investment.

(b) *Environmental Standards*

6. Differing national environmental policies, for example with regard to the tolerable amount of pollution and to quality and emission standards, are justified by a variety of factors including among other things different pollution assimilative capacities of the environment in its present state, different social objectives and priorities attached to environmental protection and different degrees of industrialisation and population density.

7. In view of this, a very high degree of harmonisation of environmental policies wihch would be otherwise desirable may be difficult to achieve in practice; however it is desirable to strive towards more stringent standards in order to strengthen environmental protection, particularly in cases where less stringent standards would not be fully justified by the above mentioned factors.

8. Where valid reasons for differences do not exist, Governments should seek harmonisation of enivronmental policies, for instance

with respect to timing and the general scope of regulation for particular industries to avoid the unjustified disruption of international trade patterns and of the international allocation of resources which may arise from diversity of national environmental standards.

9. Measures taken to protect the environment should be framed as far as possible in such a manner as to avoid the creation of non-tariff barriers to trade.

10. Where products are traded internationally and where there could be significant obstacles to trade, Governments should seek common standards for polluting products and agree on the timing and general scope of regulations for particular products.

National Treatment and Non-Discrimination

11. In conformity with the provisions of the GATT, measures taken within an environmental policy, regarding polluting products, should be applied in accordance with the principle of national treatment (i.e. identical treatment for imported products and similar domestic products) and with the principle of non-discrimination (identical treatment for imported products regardless of their national origin).

Procedures of Control

12. It is highly desirable to define in common, as rapidly as possible, procedures for checking conformity to product standards established for the purpose of environmental control. Procedures for checking conformity to standards should be mutually agreed so as to be applied by an exporting country to the satisfaction of the importing country.

Compensating Import Levies and Export Rebates

13. In accordance with the provisions of the GATT, differences in environmental policies should not lead to the introduction of compensating import levies or export rebates, or measures having an equivalent effect, designed to offset the consequences of these differences on prices. Effective implementation of the guiding principles set forth herewith will make it unnecessary and undesirable to resort to such measures.

b. Consultations

14. Consultations on the above mentioned principles should be pursued. In connection with the application of these guiding principles, a specific mechanism of consultation and/or notification or some other appropriate form of action should be determined as soon as possible taking into account the work done by other international organizations.

appendix 2

agreement on cooperation in the field of environmental protection between the united states of america and the union of soviet socialist republics

The Government of the United States of America and the Government of the Union of Soviet Socialist Republics:

Attaching great importance to the problems of environmental protection;

Proceeding on the assumption that the proper utilization of contemporary scientific, technical and managerial achievements can, with appropriate control of their undesirable consequences, make possible the improvement of the interrelationship between man and nature;

Considering that the development of mutual cooperation in the field of environmental protection, taking into account the experience of countries with different social and economic systems, will be beneficial to the United States of America and the Union of Soviet Socialist Republics, as well as to other countries;

Considering that economic and social development for the benefit of future generations requires the protection and enhancement of the human environment today;

Desiring to facilitate the establishment of closer and long-term cooperation between interested organizations of the two countries in this field.

In accordance with the Agreement between the United States of America and the Union of Soviet Socialist Republics on Exchanges and Cooperation in Scientific, Technical, Educational, Cultural, and Other Fields in 1972–1973, signed April 11, 1972, and developing further the principles of mutually beneficial cooperation between the two countries;

Have agreed as follows:

article 1

The Parties will develop cooperation in the field of environmental protection on the basis of equality, reciprocity, and mutual benefit.

article 2

This cooperation will be aimed at achieving the most important aspects of the problems of the environment and will be devoted to working out measures to prevent pollution, to study pollution and its effect on the environment, and to develop the basis for controlling the impact of human activities on nature.

It will be implemented, in particular, in the following areas:

Air pollution;

Water pollution;

Environmental pollution associated with agricultural production;

Enhancement of the urban environment.
Preservation of nature and the organization of preserves;
Marine pollution;
Biological and genetic consequences of environmental pollution;
Influence of environmental changes on climate;
Earthquake prediction;
Arctic and subarctic ecological systems;
Legal and administrative measures for protecting environmental quality.

In the course of this cooperation the Parties will devote special attention to joint efforts improving existing technologies and developing new technologies which do not pollute the environment, to the introduction of these new technologies into everyday use, and to the study of their economic aspects.

The Parties declare that, upon mutual agreement, they will share the results of such cooperation with other countries.

article 3

The Parties will conduct cooperative activities in the field of environmental protection by the following means:

Exchange of scientists, experts and research scholars;
Organization of bilateral conferences, symposia and meetings of experts;
Exchange of scientific and technical information and documentation, and the results of research on environment;
Joint development and implementation of programs and projects in the field of basic and applied sciences;
Other forms of cooperation which may be agreed upon in the course of the implementation of this Agreement.

article 4

Proceeding from the aims of this Agreement the Parties will encourage and facilitate, as appropriate, the establishment and development of direct contacts and cooperation between institutions and organizations, governmental, public and private, of the two countries, and the conclusion, where appropriate, of separate agreements and contracts.

article 5

For the implementation of this Agreement a US–USSR Joint Committee on Cooperation in the Field of Environmental Protection shall be established. As a rule this Joint Committee shall meet once a year in Washington and Moscow, alternately. The Joint Committee shall approve concrete measures and programs of cooperation, designate the participating organizations responsible for the realization of these programs and make recommendations, as appropriate, to the two Governments.

Each Party shall designate a coordinator. These coordinators, between sessions of the Joint Committee, shall maintain contact between the United States and Soviet parts, supervise the implementation of the pertinent cooperative programs, specify the individual sections of these programs and coordinate the activities of organizations participating in environmental cooperation in accordance with this Agreement.

article 6

Nothing in this Agreement shall be construed to prejudice other agreements concluded between the two Parties.

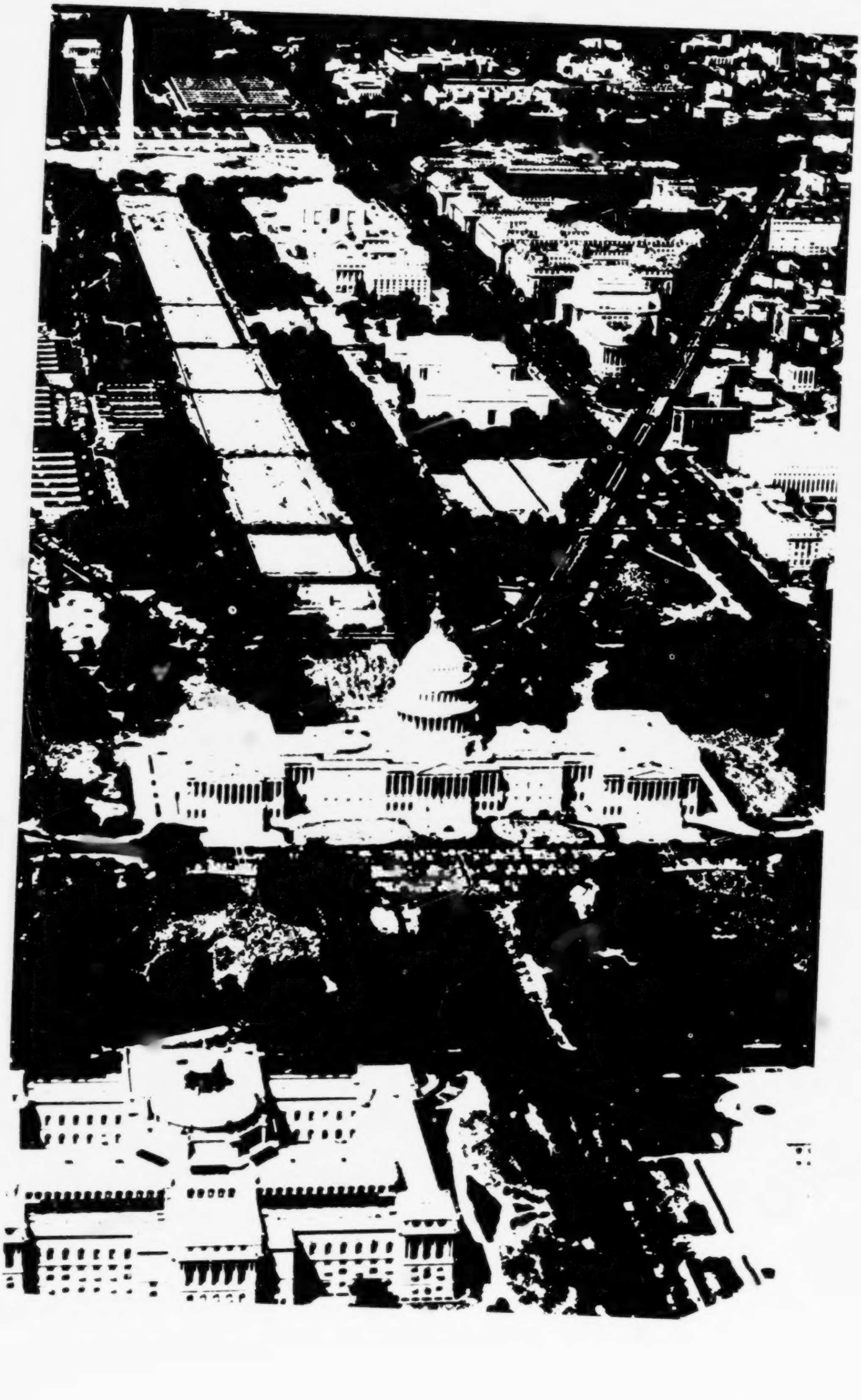
article 7

This Agreement shall enter into force upon signature and shall remain in force for five years after which it will be extended for successive five year periods unless one Party notifies the other of the termination thereof not less than six months prior to its expiration.

The termination of this Agreement shall not affect the validity of agreements and contracts between interested institutions and organizations of the two countries concluded on the basis of this Agreement.

DONE on May 23, 1972 at Moscow in duplicate, in the English and Russian languages, both texts being equally authentic.

FOR THE UNITED STATES OF AMERICA:	FOR THE UNION OF SOVIET SOCIALIST REPUBLICS:
RICHARD NIXON	N. V. PODGORNY
President of the United States of America	*Chairman of the Presidium of the Supreme Soviet of the U.S.S.R.*



4 the past year — expanding federal role

A great deal of progress has been made in the past year in implementation of the far-reaching Clean Air Amendments of 1970, in enforcement of other environmental laws, in Congressional consideration—but not passage—of a wide range of environmental legislation, and in the conclusion of several significant international agreements. The Federal Government is also moving ahead with a variety of other activities, from protecting wildlife, to acquiring parks and natural areas, to using Government procurement as an incentive for greater recycling.

The Environmental Protection Agency (EPA) promulgated a series of proposed and final regulations spelling out requirements of the Clean Air Amendments of 1970. The plans of all 50 States and other jurisdictions to implement EPA's national ambient air quality standards have been given partial or final approval. Two of the year's most dramatic developments were EPA's denial of the auto industry's request for a 1-year extension of the 1975 auto emission standards and its cancellation of most uses of DDT as of December 31, 1972.

Both the House and the Senate passed comprehensive new water quality bills. They would greatly increase aid to States and localities for building waste treatment facilities and would set new goals for cleanup of our rivers, lakes, and other waters. However, a Congressional conference committee has not yet resolved the differences between the two pieces of legislation. The Marine Protection Act, a bill to regulate ocean dumping of wastes, has also passed both Houses and awaits final action.

The Justice Department filed numerous criminal and civil actions under the Refuse Act of 1899 against violators of water quality standards.

In April 1972, President Nixon and Prime Minister Trudeau of Canada signed an agreement to cooperate in cleaning up the Great Lakes, and in May the President signed an environmental agreement with President Podgorny of the Soviet Union. Chapter 3 of this report, on international aspects of the environment, discusses these agreements.

The House passed legislation to curb noise pollution and control the use of pesticides, and the Senate is considering action on these measures. The Senate passed, and the House is considering, legislation to expand Federal control over the manufacture and use of toxic substances. Expenditures to abate pollution from Federal facilities continue to climb.

Many of the President's 1971 land use control proposals are being transformed into legislation. They include proposals for a national land use policy, control of powerplant siting and mined areas, tax incentives to discourage wetlands development and to preserve historic buildings, and a national policy for the use and management of Federal public lands.

Momentum is building behind efforts to extend and preserve parks and wilderness areas and to shield wildlife from man's destructive ways. More Federal surplus properties have been made available for State and local parks. New Wilderness Areas have been designated by the Congress since last year, and others have been identified and proposed by the President. New legislation has been proposed by the President to protect endangered species. And the President has banned the use of poisons to control predators on Federal lands.

This chapter describes the significant Federal achievements, developments, and initiatives of the past year. It also assesses the present status of organizational reform and Congressional activity. The chapter includes information on activities occurring up to July 1, 1972.

controlling pollution

air quality

implementing the 1970 clean air amendments—The Federal program to enhance air quality moved forward as EPA and the States began to implement their numerous regulatory responsibilities under the comprehensive Clean Air Amendments of 1970.[1] The broadest effort centered on the submission, review, and approval of State plans to implement national ambient air quality standards. There were other important developments concerning the 1975–76 automobile emission standards, low emission vehicles, hazardous air pollutants, stationary sources of air pollution, and lead in gasoline.

state plans—In April 1971, EPA established primary and secondary national ambient air quality standards for six of the most widespread air pollutants—particulate matter, sulfur oxides (SO_x), carbon monoxide (CO), hydrocarbons, oxides of nitrogen (NO_x) and photochemical oxidants.[2] The Clean Air Amendments call on States to develop plans to achieve, within 3 years after their approval by EPA, primary standards to protect public health. Secondary standards—to safeguard aesthetics, vegetation, and materials—are to be achieved within a reasonable time period.

States submitted their plans early in 1972.

On May 31, 1972, EPA approved 14 plans and partially approved 41 plans[3] covering all States and five other jurisdictions.

Eighteen States were given 2-year extensions to meet primary standards. These States encompass urban areas with severe pollution from automobiles. EPA also granted 13 States 18-month extensions—to July 30, 1973—to submit plans for implementing secondary ambient air quality standards for 31 air quality control regions. EPA's decisions have been challenged in the courts by both industry[4] and environmental groups.[5]

On May 30, 1972, the day before EPA's deadline to approve or disapprove State implementation plans, a Federal district court ruled that the Administrator could not approve a plan that would allow significant deterioration of existing air quality in areas where the air already is cleaner than under the standards set by EPA.[6] The basic issue involved is whether, under the 1970 amendments, EPA must require States to maintain the quality of air that is already clean or whether States must merely prevent ambient pollution levels from exceeding Federal standards. The court's order did not prevent EPA from announcing its actions on State plans, but required the Administrator to revise EPA's regulations on this matter, and to advise States of any additional measures needed to prevent deterioration of clean air. EPA has appealed the decision.

Among the most challenging of the standards that States must meet by the 3-year deadline are those for automotive pollutants—CO, hydrocarbons, and NO_x. Although the Federal Government has been regulating new automobile exhaust emissions since the 1968 model year and the regulations have been growing progressively more rigorous, the stringent emission standards set by the 1970 amendments will not take effect until the 1975 and 1976 model years.

To meet ambient standards, some States will need to abate the substantial pollution which results from emissions of older automobiles, which do not fall under Federal standards. Many States submitted plans calling for strict controls over vehicular traffic in cities and for expanding mass transit to help reach primary ambient air quality standards.

1975–76 auto emission standards—The 1970 amendments require 1975 standards for new car emissions of CO and hydrocarbons to be 90 percent below the 1970 standards. They also require the 1976 standard for NO_x emissions to be 90 percent below 1970 emission levels, which were uncontrolled. However, the law allows a 1-year extension if the EPA Administrator determines that such an extension is essential to the public interest or public health and welfare of the United States; that all good faith efforts have been made to meet the standards for which the extension has been requested; that the applicant has established that effective control technology, processes, operating methods, or other alternatives are not available or have not been available for a sufficient period of time to achieve compliance prior to the effective date of the standards; and that a study and investigation by the National Academy of Sciences (NAS) have indicated that such alternatives are not available to meet the standards.

In March and April of 1972, A. B. Volvo, International Harvester Co., Chrysler Corp., Ford Motor Co., and General Motors Corp. applied to EPA to suspend the 1975 emission standards for 1 year. On May 12, 1972, after 3 weeks of public hearings, the Administrator denied the suspension requests.[7] He acknowledged that the standards were difficult for the companies to meet but stated that they had failed to establish, as required by law, that the necessary technology does not exist. Pointing to progress in building and using catalytic systems to control emissions, he concluded that the necessary technology may well be available for 1975 model cars. U.S. auto manufacturers have appealed his decision in a Federal court of appeals.[8]

regulating lead and phosphorous in gasoline—In February 1972, EPA issued proposed regulations to make one grade of lead-free and phosphorous-free gasoline generally available by July 1, 1974. The agency also called for a phased reduction in the lead content of regular and premium gasolines.[9] Lead in gasoline fouls the catalytic emission control devices likely to be used to meet the 1975–76 standards for CO, hydrocarbons, and NO_x. EPA's regulations aim to assure that a gasoline compatible with such devices will be ready, as well as to protect public health.

Specifically, the proposed regulations provide that one grade of gasoline of not less than 91-octane shall be lead-free and phosphorous-free after July 1, 1974. They would also require that the lead content of higher octane regular and premium grades be limited to a maximum of 2.0 grams per gallon after January 1, 1974, 1.7 grams after January 1, 1975, 1.5 grams after January 1, 1976, and 1.25 grams after January 1, 1977. The proposed regulations define lead-free as a maximum 0.05 gram per gallon and phosphorus-free as a maximum 0.01 gram per gallon.

other motor vehicle pollution regulations—The 1970 amendments require the Government to purchase certified low emission vehicles. However, their cost cannot exceed 150 percent—200 percent if the vehicle is powered by an inherently low-polluting propulsion system—of the cost of the vehicle that they are to replace. In

October 1971, EPA published final regulations spelling out conditions under which the Federal Government will buy low emission vehicles at a premium price to stimulate development of emission control systems that go beyond what current standards require.[10] The vehicles must be found by EPA to have low emissions and must be certified by an interagency board as a suitable substitute for a conventional vehicle. In addition to meeting 1973 and 1974 automotive emission standards, the EPA regulations currently require achievement of either 1975 standards for CO and hydrocarbons or 1976 standards for NO_x.

Auto makers are now required to provide instructions for properly maintaining air pollution control systems to assure that vehicles continue to comply with Federal emission standards throughout their useful life. In its final regulations on maintenance, EPA defined useful life as 5 years or 50,000 miles for light-duty vehicles and heavy-duty gasoline engines, and 5 years or 100,000 miles for heavy-duty diesel engines.[11] The regulations require the instructions to include information on the exhaust, crankcase, and evaporative-emission control system, as well as methods of identifying and correcting malfunctions in the system.

developing a clean car—In cooperation with EPA's Advanced Automotive Power Systems program and with some EPA funding, the U.S. Army has developed two prototype stratified charge engines which have met the 1975–76 emission levels in initial tests. The test engines power a jeep developed under contracts with Texaco and Ford Motor Co. Tests are continuing on these vehicles to determine if satisfactory achievement of emission reductions can be maintained through the required 50,000-mile durability test period.

The stratified charge engine resembles in many respects a conventional internal combustion engine—with certain differences in the combustion chamber design and the fuel injection system. The engine in the test vehicles are 72 horsepower, have four cylinders, and use 91-octane unleaded gasoline with an exhaust gas recirculation system and a catalytic muffler. Although it is the cleanest engine system tested to date, its durability remains to be established.

EPA is also supporting the development of three types of Rankine cycle engines (including a steam engine) as very low emission alternatives to the standard internal combustion engine. In addition, EPA is helping develop solutions to technical problems of the automotive gas turbine engine, one potential replacement for the internal combustion engine.

The Urban Mass Transit Administration (UMTA) of the Department of Transportation (DOT) is sponsoring the development and demonstration in passenger service of steam powered transit buses in Oakland, Calif. The city of Lansing, Mich., under a grant from UMTA, is purchasing six electric battery powered buses for its municipal bus system.

Through its dual fuel test program, the General Services Administration (GSA) has moved to reduce pollution from automobile emissions. Dual fuel is a unique method of powering vehicles with either regular gasoline or low polluting gaseous fuels, including compressed natural gas (CNG), liquefied natural gas (LNG), and liquid petroleum gas (LPG). Tests indicate that operating on gaseous fuels can trim noxious vehicular emissions by as much as 87 percent from emissions with gasoline. This reduction often meets or exceeds 1975 Federal new car standards for all emissions except nitrogen oxides.

GSA now has close to 1,250 vehicles converted to dual fuel across the country. This program could demonstrate that clean burning gaseous fuel use will be practicable for fleet operations in urban areas and will provide side benefits by reducing engine maintenance costs.

aircraft smoke reduction—The aircraft industry is cutting smoke pollution from existing airplane engines. The industry entered a voluntary agreement in 1970 with the Department of Health, Education, and Welfare (HEW), which then administered the air pollution control program, and with DOT to retrofit the widely used JT8D jet engines with smoke reduction devices. Over 3,000 Boeing 727's and 737's and Douglas DC–9 aircraft engines are involved. As of March 31, 1972, 2,625 engines, or 78 percent of the total, had been retrofitted. The schedule calls for the program to be substantially completed by the end of 1972. Retrofit involves installing new combustors for more efficient burning of fuel in the engines. This in turn significantly reduces particulate matter, carbon monoxide, and hydrocarbon emissions. All JT8D engines produced since February 1970 have been equipped with smokeless combustors.

stationary sources—Late in 1971, EPA spelled out final air pollution performance standards for fossil fuel steam generators, sulfuric and nitric acid plants, portland cement plants, and large incinerators.[12] The standards apply to new plants and to existing plants that increase or alter the nature of their emissions. They limit emissions for particulate matter, sulfur dioxide, nitrogen oxides, and sulfuric acid mists, as well as visible emissions. EPA's stationary source standards have been challenged in court by industry [13] for, among other things, EPA's alleged failure to comply with section 102(2)(C) of the National Environmental Policy Act (NEPA).[14] EPA has also proposed emission standards for three hazardous air pollutants—asbestos, beryllium, and mercury—the first such standards set under the 1970 Clean Air Amendments.[15] Public hearings on the proposed standards were held early in 1972, and a final decision is expected early in 1973.

enforcement—In its first use of the enforcement authority in section 113 of the Clean Air Act, EPA moved against the alleged violation of Delaware's air quality implementation plan by the Delmarva Power and Light Co. of Delaware City, Del. The company allegedly uses 6.5–7.0 percent sulfur fuel in producing electricity and steam. In 1969, according to EPA, Delmarva emitted 71,630 tons of sulfur dioxide into the air, equivalent to 37.7 percent of total sulfur dioxide emissions in New Castle County.

To comply with the State's approved implementation plan, the utility would have had to switch to 3.5 percent sulfur fuel by January 1, 1972, and then cut down to 1 percent by January 1973. The company sought a variance from the Delaware plan, but its request was denied by the State following a hearing. Delmarva got a State court order preventing the State from enforcing its implementation plan pending the court's review. It was at this point that EPA entered the case, and on March 6, EPA issued a violation notice. On April 17, EPA issued an order requiring compliance by May 1. Enforcement of EPA's order has been stayed pending the outcome of an appeal heard in Federal court on June 23, 1972.[16]

In December 1971, EPA invoked its emergency powers under the Clean Air Act to restrain industrial activity during an air pollution episode in Birmingham, Ala. A combination of climatic conditions and emissions from industrial sources had created the emergency condition. Pollution was measured at a level of 771 micrograms of particulate matter per cubic meter of air in 1 day and 758 micrograms the following day. EPA's particulate matter "alert" level is a 24-hour average measurement of 375 micrograms; the "warning" level is 625 micrograms; and the "emergency" level is 875 micrograms. The emergency level is considered a peril to health. Section 303 of the Clean Air Act grants EPA emergency powers to seek restraining orders to halt air pollution when there is "an imminent and substantial danger to the health of persons"—which EPA considered the case in Birmingham.

The Jefferson County Department of Health, having been unsuccessful in getting the industries to curtail operations, invited an EPA team of scientists and lawyers, accompanied by representatives of the Department of Justice, to come to Birmingham. Acting under section 303, at EPA's request, the Justice Department obtained a temporary restraining order from the U.S. District Court in Birmingham requiring 23 local industries to halt their emissions of air pollutants.[17]

attack on sulfur oxides—In his Environmental Message of February 8, 1971, the President pointed out that sulfur oxides are among the most damaging air pollutants. They cost society billions of dollars annually in damage to human health, materials, vegetation, and property. At that time the President said a charge on emissions of sulfur into the atmosphere would be a major step in applying the principle that the costs of pollution should be included in the price of the product. On February 8, 1972, after further study by the Council on Environmental Quality (CEQ), the Treasury Department, and EPA, the President submitted the Pure Air Tax Act of 1972 to the Congress.[18]

The proposed bill would levy a tax, beginning with calendar year 1976, on emissions of sulfur into the atmosphere. The tax rate for 1976 would be based on 1975 air quality, the year in which the Clean

Air Amendments require compliance with primary ambient air quality standards. In years after 1976, the tax rate—applied to that year's emissions or fuel purchases—would be determined by a region's air quality in the preceding year. The tax would be imposed directly on the sulfurous emissions of those sources large enough to measure and monitor their emissions. Emitters of small amounts would pay the tax on the sulfur content of their fuel.

In regions failing to meet both the national primary and secondary air quality standards for sulfur oxides the tax rate would be 15 cents per pound of sulfur emitted into the atmosphere. The tax would be 10 cents in regions where there was no violation of the primary standards during the preceding calendar year but the secondary standards were violated. There would be no tax in regions where neither the primary nor secondary standard were violated.

The Pure Air Tax would spur reduction of sulfur oxides to meet both primary and secondary standards. It should stimulate firms to develop and install control technology and to use clean fuels as quickly as possible to minimize their tax liability. Although most State implementation plans provide for meeting both standards at the same time, deadline extensions are possible. The proposed sulfur oxides tax creates a strong financial incentive for companies to meet secondary standards by 1975, or as soon thereafter as possible, speeding the drive to achieve higher air quality.

water quality

pending water quality legislation—The President proposed comprehensive water quality legislation in February 1970 and again in 1971. These proposals, as revised in 1971, are detailed in last year's Annual Report.[19] After extensive hearings the Senate and House, in November 1971 and March 1972 respectively, passed comprehensive water quality bills that are now being considered by a joint conference committee.[20]

The Senate and House bills both embody many features proposed by the President: extending the Federal-State program to all navigable waters; setting effluent standards for individual facilities; making mandatory the use of the best available technology in new facilities; issuing stringent Federal standards for toxic discharges; strengthening and streamlining Federal enforcement procedures; levying stiff fines; letting citizens bring legal actions to enforce standards; and requiring self-sufficient municipal financing of treatment plants once the current backlog of municipal needs has been met. Both bills also give EPA new legislative authority to continue the important nationwide permit program which the President initiated administratively in December 1970[21] under the Refuse Act of 1899,[22] the only authority then available.

Despite their similarity on many points, the Senate and House bills differ in some important respects. Foremost among these, they disagree on the basis for establishing effluent limitations and on how much the Federal Government will control the permit program after State permit programs have been approved. The Senate bill would base effluent limitations on levels of available technology—"best practicable" technology by 1976 and "best available" by 1981—with a "no discharge" policy to take effect by 1985. Accepting the 1976 goal, the House bill provides that no action will be taken on the 1981 and 1985 goals until the National Academies of Engineering and Science have made a 2-year study of the economic, social, and environmental effects of achieving or not achieving the goals. Action on these goals could only be taken if a new law were passed after the submission of the Academies' report. The House bill would allow EPA to grant a 2-year extension to the 1976 deadline to individual dischargers under certain narrow conditions, while the Senate bill does not provide for such an extension. For the permit program, the Senate bill allows a Federal veto of individual permits issued by States with approved permit programs, while the House bill seeks to give States more latitude on individual permits. The House bill also includes provisions that industrial dischargers who voluntarily install best available technology before 1 year following the National Academies' report will have no more stringent effluent standard imposed upon them for either 12 years or the period of amortization of a facility, whichever is shorter; thermal discharges are to be the subject of specific regulation apart from the general regulatory authority of the Act; and citizen standing to sue the Government would be more limited than provided by the Senate bill.

pending ocean dumping legislation—Based on a CEQ report in October 1970 the President called for a comprehensive national policy on ocean dumping.[23] In February 1971 he recommended legislation to ban unregulated dumping and to strictly limit disposal of any materials harmful to the marine environment. This legislation would require a permit from the Administrator of EPA to transport and dump any wastes originating in the United States into estuaries, the Great Lakes, and the oceans anywhere in the world. It would prohibit dumping by U.S. and foreign nationals in our territorial waters and in the contiguous zone—out to the 12-mile limit.

The Administrator would also be empowered to ban ocean dumping of certain materials and to designate safe disposal sites for others. Transportation for dumping in violation of these regulations, dumping without a permit, or dumping in violation of a permit would be subject to civil and criminal penalties. The Coast Guard would be given authority to monitor compliance and enforce the regulations. Both the House and Senate have passed bills largely incorporating the President's proposals.[24] A joint House and Senate conference committee has resolved differences between the two versions.

other proposed legislation.—The President has proposed new legislation to deal with two important potential or actual sources of water pollution that are inadequately covered under the existing Federal Water Pollution Control Act—sediment control and land disposal of toxic wastes.

The Sediment Control Act[25] would install controls over nonagricultural land-disturbing activities, primarily building and road construction. The urban concentration of such activities and their substantial per-acre yield of sediment often lead to particularly severe water quality problems. The Act calls upon States to implement a sediment control regulatory program, including permits where appropriate, to control land-disturbing activities that prevent attainment of water quality standards. EPA would be authorized to issue and enforce appropriate regulations in States that fail to implement approved programs and would be empowered to enforce State regulations when a State itself fails to do so.

As disposal of toxic substances directly into surface waters and the oceans is curbed, the land becomes the last receptacle for disposal of such wastes. Some highly toxic wastes already are being injected into the ground in deep wells, creating potential hazards for future years. The Toxic Waste Disposal Control Act,[26] calls for a nationwide program to regulate both land and underground disposal of wastes hazardous to human health. The Act would authorize the Administrator to set regulations on locations and procedures for toxic waste disposal and would require State permit and regulatory programs. Except in cases where a State fails to meet EPA guidelines, the program would be administered by the States. In those cases EPA would issue the necessary regulations.

marine sanitation regulations—In June 1972, EPA published final standards laying out a number of steps to curtail discharges of vessel sewage into U.S. navigable waters.[27] The standards cover approximately 500,000 recreational boats as well as Navy and merchant ships. Coast Guard regulations for enforcing the standards will be published early in 1973. EPA's standards require that 2 years from the date of the Coast Guard regulations new vessels with marine toilets must also be equipped with holding tanks to retain sewage on board for discharge into shore-based pumping stations and subsequent disposal into municipal treatment systems. Existing vessels will have 5 years from the same date to comply with the standards and under certain circumstances can substitute on-board primary treatment devices for holding tanks. States may completely prohibit vessel discharges immediately, if EPA approves. Thirty-one States now have some kind of controls over vessel sewage.

oil and hazardous substances spills—In 1971, the Coast Guard received 8,496 reports of polluting discharges in U.S. waters compared to 3,711 reported spills in 1970.[28] The great difference in the number of reported spills is the result of new reporting requirements. Although the number of spills reported increased substantially, the volume of spillage dropped sharply from approximately 15 million gallons in 1970 to about 9 million gallons in 1971. The Coast Guard is currently analyzing the data to determine the reasons for the decrease in spillage. See Table 1 for further 1971 spill data.

A number of Federal agencies act to prevent oil spills and to cope with them when they do occur. The National Oil and Hazardous Substances Pollution Contingency Plan, which was revised and published in August 1971, embodies procedures for coordinated Federal action against spills through implementation of regional and local contingency plans.[29] Of the 8,496 spills reported in 1971, 3,518 resulted in activation of spill containment procedures set out in the plan. Major cleanup and disposal actions were involved in 1,132 cases.

In December 1971, the Coast Guard issued notice of proposed regulations to tighten standards for the design, construction, and operation of vessels and of bulk oil transfer facilities.[30] The regulations would reduce accidental or intentional release of oil into U.S. waters during normal vessel operations and transfer operations, and would establish construction standards designed to limit oil outflows from minor accidents.

federal grants for waste treatment facilities—The greatest single category of Federal spending for environmental quality is for constructing or improving waste treatment plants and interceptor sewers to convey wastes to the plants.

For fiscal year 1972, the President proposed $2 billion for water pollution control construction grants. However, the Congress appropriated only $1.65 billion. The largest single grant went to Chicago and totaled more than $21 million.

enforcement

the refuse act—The Refuse Act of 1899,[31] which outlaws the discharge of pollutants other than municipal sewage into navigable waters without a permit from the Army Corps of Engineers has been increasingly used for water pollution control enforcement. Criminal and civil suits under the Refuse Act have continued to mount. During the first 6 months of fiscal year 1972, 81 criminal actions were initiated. During the same period, 130 convictions were won, primarily in cases that were initiated in previous years. (See Table 2 for comparative data on Refuse Act and other enforcement actions.)

The use of civil injunctions has also been an important enforcement tool against major industrial polluters. During the first 6 months of fiscal year 1972, 52 civil suits were filed.

A Federal court injunction issued against Armco Steel Corp. in September 1971 halted the discharge of cyanide, phenol, and other hazardous substances into the Houston Ship Channel and imposed strict cleanup requirements on the company.[32] Also in September 1971, the Florida Power and Light Co. agreed to the entry of a consent decree requiring it to construct a cooling system and to take other steps to abate the thermal pollution of water by its fossil fuel and nuclear powerplants. This settlement concluded the first civil injunction action initiated under the Refuse Act.[33]

Table 1

Polluting Spills in U.S. Waters, 1971

	Number	Percent of total	Volume (thousands of gallons)	Percent of total
Total spills reported[1]	8496		8991	
Location				
Internal waters (harbors, rivers, bays, etc.)	7227	85	5653	63
Great Lakes	377	4	2594	29
Territorial sea	308	4	38	<1
Contiguous zone (3 to 12 miles offshore)	392	5	651	7
High seas beyond contiguous zone	192	2	20	<1
Type of pollutant				
Light oil (light crudes, gasoline, benzene, etc.)	4303	51	2932	33
Heavy oil (kerosene, diesel oil, fuel oil, resids, heavy crudes)	1569	18	2987	33
Waste oil	911	11	164	2
Other oil	663	8	2714	30
Other substances (hazardous commodities, chemicals, gases, etc.)	172	2	112	1
Miscellaneous (sewage, refuse, dredge spoil)	94	1	5	<1
Unknown	784	9	189	2
Source				
Vessel	2086	25	4012	45
Tanker	380	5	1666	19
Tank barge	816	10	1304	15
Other	890	10	1042	12
Transportation related facility	1932	23	1429	16
Marine facility	390	5	256	3
Vehicle	74	<1	101	1
Pipeline	1446	17	912	10
Other	22	<1	160	2
Nontransportation related facilities	2022	24	3208	36
Onshore production	28	<1	4	<1
Offshore production	1095	13	118	1
Refinery	187	2	2207	25
Onshore bulk storage (includes tank farms)	295	3	447	5
Other	417	5	432	5
Miscellaneous and unknown	2456	29	356	4
Cause				
Casualty (includes collision, grounding, and blowouts)	205	2	3046	34
Rupture, leak or structural failure	2754	32	3716	41
Equipment failure (valves, pumps, pumps, alarms)	941	11	378	4
Personnel failure	827	10	1037	12
Deliberate discharges	359	4	75	<1
Natural phenomenon	102	1	8	<1
Unknown	3308	39	729	8

[1] Totals may not agree due to rounding.

Source: U.S. Coast Guard.

Table 2

Water Pollution Enforcement Actions

	Fiscal years					
	1967	1968	1969	1970	1971	1972[1]
Refuse Act						
Criminal actions filed	56	41	46	129	191	81
Convictions	[2]	[2]	42	59	127	130
Civil actions filed	0	0	0	2	56	52
Settlements	0	0	0	0	7	17
Federal Water Pollution Control Act						
New enforcement conferences	4	3	2	4	3	6
Reconvenings and additional session of conferences	5	6	8	6	9	7
180-day notices				10	9	82
Municipalities				2	5	56
Industry				8	4	26

[1] Refuse Act-first 6 months, FWPCA-first 9 months.
[2] No figure available.
Sources: EPA, Department of Justice.

In December 1970, the President announced a program to control water pollution from industrial sources by requiring firms and individuals to file for Refuse Act permits. Since then, approximately 20,000 applications have been received from discharges accounting for more than 90 percent of industrial effluents. To get a permit, an industrial discharger must specify the type and amount of effluent he intends to discharge and, if the effluent does not meet applicable water quality standards, an abatement plan and compliance schedule. Violators of water quality standards or compliance schedules, as well as dischargers without permits, are liable to enforcement action. As of June 1, 1972, 2,559 applications had been processed by the Corps, reviewed by EPA, and referred to appropriate State agencies for certification. Because of the complexities of the program, many incomplete forms had to be returned to applicants for further information.

On December 21, 1971, the U.S. District Court for the District of Columbia in the case of *Kalur* v. *Resor*,[34] enjoined further granting of permits until Corps regulations were amended to require environmental impact statements under section 102(2)(C) of NEPA.[35] The court also held that permits could not be issued under the Act for discharges into nonnavigable tributaries of U.S. navigable waters. The permit program, which calls for EPA's concurrence on water quality aspects, had been excluded from environmental impact statement requirements in accordance with section 5(d) of CEQ's guidelines[36] and the legislative history of NEPA. (See Chapter 7, on the National Environmental Policy Act, for a discussion of the *Kalur* decision.)

On May 30, 1972, another court decision further complicated the use of the Refuse Act to control water pollution. The Third Circuit Court of Appeals, in the case of *U.S.* v. ***Pennsylvania Industrial Chemical Corp.*** (PICCO),[37] ruled that the company could not be held criminally responsible under the Refuse Act for discharges prior to the existence of a Federal permit program. Because, under ***Kalur***, permits are presently unavailable, the ***PICCO*** ruling may mean that prosecution of current polluters is barred. The combined effect of both decisions has been to impede implementation of the Refuse Act. In order to resolve the issues, EPA has asked the Department of Justice to seek a rehearing in the ***PICCO*** case and an expedited appeal in the *Kalur* case.

other enforcement authorities—The Refuse Act is an important mechanism for enforcing water quality standards because it permits swifter and more clear-cut action against polluters than does the Federal Water Pollution Control Act (FWPCA).[38] The two present FWPCA enforcement mechanisms for pollution abatement are limited and cumbersome. The first is a three-step procedure starting with a conference of Federal, State, and interstate water quality agency representatives, and followed, if necessary, by a public hearing, and finally court action.

The Federal Government cannot call a conference, except at State request, unless pollution from one State damages either water quality in another State or if shellfish are endangered. The enforcement conference is a mechanism for bringing to light widespread and longstanding pollution situations in a significant section of a river basin, for example. After the conclusion of a conference, which is similar to a public hearing, recommendations for action are drawn up and transmitted to the States by the EPA Administrator. If action is not forthcoming, the Administrator may reconvene the conference or call a formal public hearing. If action is still not forthcoming after a hearing, the Federal Government can then go into court.

Six new enforcement conferences were called by EPA in fiscal year 1972. One covered pollution of Pearl Harbor at Honolulu, Hawaii, and was called at Federal initiative because of damage to shellfish. Two covered pollution of the Ohio River and its tributaries in Pennsylvania, West Virginia, and Ohio. Other conferences addressed: mercury pollution of the waters of western South Dakota; damage to shellfish from pollution of Mount Hope Bay in Massachusetts and Rhode Island; and pollution of the Savannah River in Georgia and South Carolina. EPA also reconvened and convened additional sessions of seven conferences in fiscal year 1972 covering pollution in Dade County, Fla.; the Monongahela River in West Virginia, Maryland, and Pennsylvania; Boston Harbor, Mass.; Galveston Bay, Tex.; Mount Hope Bay in Massachusetts and Rhode Island; the Escambia River and Bay in Alabama and Florida; and the Colorado River in several Western States.

The second enforcement procedure under the FWPCA, also applicable primarily to interstate pollution, calls for a 180-day notification both to the violator of water quality standards and to interested parties, followed by court action if necessary. This process, although much faster, is not capable of the same geographic scope as the conference. The 180-day notice gives violators the opportunity to comply voluntarily. In the first 9 months of fiscal year 1972, EPA served 180-day notices to 82 entities—26 to industries and 56 to municipalities.

One of the most publicized enforcement actions under the 180-day notice procedure was against the Reserve Mining Co. of Minnesota. After an enforcement conference, begun in 1969, failed to produce results acceptable to EPA, the agency gave Reserve a 180-day notice in April 1971. EPA alleged that Reserve's daily discharges into Lake Superior—67,000 tons of taconite tailings from its iron ore processing operations, a volume many times greater than the total volume of solids carried into the lake by its tributaries—violated water quality standards. EPA concurrently employed a consulting firm to determine if alternative methods of total or partial land disposal were feasible. The consultant reported five alternatives, all of them rejected by Reserve. Because the 180-day notice also failed to produce a remedy, EPA requested the Department of Justice to bring court action against Reserve. On February 17, 1972, the Department filed suit in a Federal district court requesting a schedule from the company on its plans to abate its discharges into Lake Superior. On May 4, 1972, the Department added to its complaint that Reserve's discharges constituted a public nuisance abatable through Federal common law. (See discussion of the Supreme Court decision in *Illinois* v. *Milwaukee* later in this chapter.)

cleanup of federal facilities

Last year's Annual Report traced the progress of the Federal Government's efforts to clean up air and water pollution from its own facilities. This is a direct outgrowth of extensive efforts triggered by Executive Order 11507, issued by President Nixon on February 4, 1970.[39] That Order directs Federal agencies to complete or to have underway by December 31, 1972, actions to achieve compliance with existing air and water quality standards.

Since that Executive Order was issued, Federal agencies have been working hard to identify pollution problems and to plan, design, and initiate necessary abatement projects for facilities under their jurisdiction. In fiscal year 1971, the first year of the accelerated cleanup program, the President's budget devoted $115.7 million for such projects—compared to an average of $52 million for the 3 prior fiscal years. In fiscal year 1972, $280.4 million was budgeted. And the President has asked the Congress for $314.6 million for fiscal year 1973.

Federal agencies are involved in a range of activities to control pollution from their facilities. Among them are construction or modification of waste treatment plants, fuel conversion or stack gas cleaning for air pollution control, and cooperative projects with States and communities for solid or liquid waste disposal.

At Eglin Air Force Base in Florida, the Air Force has leased 150 acres of land to Okaloosa County for a pilot spray irrigation project for sewage effluent disposal. This spray irrigation treatment will halt direct discharges into Choctawhatchee Bay.

The Defense Supply Agency is studying the feasibility of using recycled lubricating oils in Government vehicles and equipment. Of the 1.25 billion gallons of used lubricating oil generated annually from all sources, an estimated 750 million gallons are dumped into landfills, burned, or allowed to drain into sewers.

The Navy is converting its ship boilers to enable the use of Navy distillate fuel (a clean-burning light fuel oil) rather than the conventional Navy special fuel oil (a heavy residual fuel). This conversion program will result in major reductions in the discharge of particulate matter and sulfur oxides.

Section 306 of the Clean Air Act of 1970, specifies that no Federal agency may enter into any contract to procure goods, materials, or services when the contract is to be performed at a facility convicted of intentionally violating clean air standards. This prohibition continues until the Administrator of EPA certifies that the condition causing the conviction has been corrected.

To implement section 306, the President issued Executive Order 11602 on June 30, 1971.[40] It requires the Federal Government to use its procurement activities, grants, and loans to achieve air pollution control goals. EPA is developing regulations to guarantee that Federal financial assistance goes only to those who comply with clean air requirements. The pending legislation to revise the Federal Water Pollution Control Act would place similar requirements on Federal agencies contracting with firms violating water quality standards.

environmental health

pest control—EPA has stepped up administrative actions to protect public health and the environment from harmful pesticides. The President has proposed legislation, now being considered by the Congress, to more effectively regulate chemicals used for pest control and has ordered administrative actions to promote use of integrated pest management.

regulatory actions—The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)[41] requires that all pesticides shipped in interstate commerce be registered with EPA. The agency may cancel a registration when the label of the product, if complied with, is inadequate to prevent injury to "man and other vertebrate animals, vegetation, and useful invertebrate animals." A registrant can appeal EPA's cancellation notice through a complicated process that may include public hearings and review by a scientific advisory group.

Suspension of a pesticide registration which, unlike cancellation, stops interstate shipments immediately can be initiated only when the product presents an "imminent hazard."

In 1971 EPA initiated registration cancellation proceedings under FIFRA against DDT, Mirex, 2,4,5,-T, aldrin, and dieldrin. After extensive hearings, on June 14, 1972, EPA banned nearly all uses of DDT.[42] The Administrator said that the continued use of DDT over the long term, except for limited uses, posed an unacceptable risk to man and the environment. Because of DDT's persistence in aquatic and terrestrial environments, its insolubility in water, and its propensity to accumulate in the food chain and to be passed up to higher forms of life, the Administrator found that no warning, even if followed, could prevent injury to man and other animals. EPA's order will not be effective until December 31, 1972, to allow time for training people in the application of substitutes, most of which are highly toxic but which degrade more quickly. An appeal of the order has been filed by DDT manufacturers[43] seeking revision of EPA's decision. The Environmental Defense Fund has also filed an appeal[44] seeking an immediate ban and reversal of EPA's decision to consider permitting use of DDT on three minor crops.

The EPA Administrator has limited the use of Mirex against the fire ant,[45] an insect that inhabits certain parts of the Southern United States. Not only do fire ants have a painful bite, but they also build mounds which interfere with agricultural machinery. EPA's decision prohibits aerial spraying and broadcast application of Mirex in coastal counties and bans its use near water areas generally. Ground broadcast application by private users is allowed if the equipment used is calibrated to deliver recommended label dosages.

An advisory group report on 2,4,5-T found that the herbicide itself is not a substantial health hazard but that, without proper production quality control, it can contain excessive levels of a dangerous impurity. EPA is reviewing the findings of the report and is proceeding with public hearings.

On June 26, 1972, EPA decided to continue cancellation proceedings against all registered uses of aldrin and dieldrin, with the exceptiion of deep-ground insertions for termite control, dipping of roots and tops of nonfood plants, and mothproofing of woolen textiles and carpets.[46] An advisory group report on aldrin and dieldrin had recommended banning aerial application and foliar spraying of these pesticides and would have curbed certain uses around the home and near streams, ponds, and waterways, but said that seed treatment and direct application to soils need not be halted. Producers and formulators of these pesticides are expected to seek a review of EPA's decision.

In the fall of 1971, EPA canceled the registration of three mercury based pesticides used to kill algae in swimming pools and in a variety of industrial situations.[47] EPA took the action after its original notice of cancellation was reviewed by a scientific advisory committee which found that continued use would emperil health. EPA's decision was not appealed. Following up on the mercury hazard, EPA on March 24, 1972, suspended and cancelled interstate shipment of 12 mercury-based products used for a variety of farm, garden, and antimildew purposes. EPA acted on the grounds that continued sales would endanger health and lead to serious environmental contamination through buildup of mercury in the food chain.[48] At the same time, EPA issued registration cancellation notices for other mercury-based pesticides and antimildew products—some 750 in all. The suspensions and cancellations cover mercury used in paint, agricultural, and antimildew products, and in other industrial uses—approximately 1 million pounds of a total of 5.3 million pounds—or 18 percent of all uses of mercury in 1970.

EPA has begun an extensive review of three persistent chlorinated hydrocarbon insecticides—benzenehexachloride (BHC), lindane, and endrin. The purpose of the review is to determine if the use of these substances, particularly around homes and gardens and on pets and humans, endangers the environment.

EPA has proposed new rules for conducting administrative hearings on pesticide registration cancellations and suspensions.[49] The new rules call for further administrative review and public hearings on pesticide decisions that the public may regard as unfavorable and potentially harmful to human health and the environment. Previously, the right to initiate review had been limited to the pesticide manufacturer whose product was threatened with removal from interstate marketing. The new rules would also require that scientific advisory committees set up by EPA to review pesticide actions solicit scientific data from public interest groups. Furthermore, the public would have the right to submit comments on an advisory committee report.

An agreement last year between EPA and the Department of Health, Education, and Welfare (HEW) clarified Federal agency responsibilities to regulate use of pesticides, drugs, and food additives.[50] The memorandum of agreement pointed out that EPA regulates economic poisons, including pesticides, under FIFRA and the Food, Drug, and Cosmetic Act.[51] Drugs and food additives which are not economic poisons are regulated by the Food and Drug Administration (FDA) under the Food, Drug, and Cosmetic Act. Because some chemical applications may be subject to regulation by both agencies, the agreement makes clear that neither agency will approve the marketing of a product if it does not fully comply with the requirements of the law administered by the other agency.

In his February 1972 Environmental Message, the President directed the Departments of Labor and HEW to use their authorities under the Occupational Safety and Health Act[52] to develop standards to protect agricultural workers from pesticide hazards. A special task force is currently at work on this project.

proposed legislation—In February 1971, the President transmitted a proposed Federal Environmental Pesticide Control Act of 1971 to the Congress. That comprehensive pesticide control legislation contains a number of important provisions: authority to control pesticide use through "restricted" and "permit only" categories, which would require a much larger State role; streamlining of procedures for cancellation and suspension of pesticides; and authority for the Administrator of EPA to regulate the disposal or storage of pesticides and pesticide containers. The bill has passed the House[53] with some changes. The Senate Agriculture and Commerce Committees have reported versions of the bill.

integrated pest management—In his 1972 Environmental Message, the President initiated a series of actions to encourage integrated pest management. This approach calls for the maximum use of natural pest population controls—such as parasites, predators, and pest-specific diseases—combined with the judicious use of selective chemical pesticides. The objective is control of pest population levels rather than complete pest eradication. Integrated pest management offers the prospect of improved pest control and minimum adverse environmental impact at lower cost to users.

The President's new program expands field testing of promising techniques. It also includes a new comprehensive crop-oriented research program and training of more integrated control specialists. It broadens federally supported monitoring of pest population levels to minimize pesticide applications. A forthcoming CEQ report will outline the rationale and benefits of the program and describe the concept of integrated pest management in more detail.

toxic substances

pcb's—In the past few years, largely because of dramatic contamination of food or food products, PCB's (polychlorinated biphenyls) has become a household word. Actually, PCB's have been used throughout the world for over four decades in a variety of industrial and consumer uses. PCB's are particularly effective coolants and insulators for electrical transformers and capacitators. Until their use was discontinued, PCB's had been the ingredient that made carbonless duplicating paper work.

On May 12, 1972, a Federal Government task force, headed by CEQ and the Office of Science and Technology (OST) recommended that all current uses of PCB's, except for electrical capacitators and transformers, be discontinued.[54] While the sole U.S. producer, the Monsanto Co., has already voluntarily limited manufacture of PCB's for use in capacitators and transformers, the task force found that imported PCB's represented a potential problem.

At the same time, EPA announced that it will recommend disapproval of Refuse Act permit applications from industries whose discharges raise ambient levels of PCB's in rivers and lakes to 0.01

part per billion or more.[55] Previously, on March 18, 1972, the Food and Drug Administration proposed new and more stringent levels for PCB's in food and food packaging and new measures to prevent contamination from accidents in food plants.[56]

The task force found that the major regulatory gap in dealing with PCB's is the absence of any broad Federal authority to obtain information, to restrict use or distribution, and to control imports. It recommended enactment of the Administration's proposed Toxic Substances Control Act, now pending before the Congress, to provide the necessary authority.

pending legislation—Based on a CEQ report on *Toxic Substances*[57] the President's proposed Toxic Substances Control Act[58] would authorize EPA to curb the use of hazardous materials in commercial products and processes. Its aim would be to control problems of environmental contamination for which air and water pollution laws are inapplicable—such as PCB contamination—or for which such laws provide only belated, after-the-fact controls. It would empower the Administrator of EPA to restrict or prohibit use or distribution of a chemical substance if necessary to protect health and the environment. The Administrator would also prescribe test standards for certain types of chemicals which manufacturers must perform before they can market such new chemicals. The Administrator would be required to consult with an independent board of scientists before proposing action to restrict a substance or before proposing test standards.

On May 30, 1972, the Senate passed a bill embodying most of the features of the President's proposal. The House has yet to complete action.

lead in paint—Last year's Annual Report chapter on Inner City Environment discussed the serious problem of lead poisoning of inner city children who eat paint chips that have flaked off the walls of deteriorating buildings. Under the Lead-Based Paint Poisoning Prevention Act of 1971,[59] HEW's Bureau of Community Environmental Management (BCEM) administers a comprehensive program, including grants, scientific research, and developmental activities, which aims to reduce or eliminate lead-based paint poisoning. To date, over $6.5 million in grants has been awarded to 40 communities. Local programs are designed to detect and eliminate lead-based paints from all interior surfaces, porches, and other exterior surfaces of residential housing on or near which children may play.

The Lead Paint Act directs the Secretary of Housing and Urban Development to study the extent of the lead-based paint problem, to determine the most effective methods of removing the paint from surfaces, and to report on results of his research to the Congress. HUD's report will be published in the summer of 1972.

The Lead Paint Act also requires HEW to move to prohibit the use of lead-based paint in residential structures constructed or rehabilitated by the Federal Government or with Federal assistance. HEW's regulations fulfilling this directive were published in March 1972.[60] In December 1971, HUD, whose programs account for the majority of Federally assisted, owned, or mortgaged residential housing, prohibited the use of paint containing more than 1 percent lead by weight of the dried paint film.[61]

FDA, acting under the Federal Hazardous Substances Act,[62] has set even stricter limits on the amount of lead contained in paint shipped in interstate commerce.[63] Effective December 31, 1972, paint or other surface coating containing lead in excess of 0.5 percent of the total weight of contained solids or dried paint film is banned from interstate commerce. One year later, on December 31, 1973, the ban tightens further, limiting lead content to 0.06 percent. The FDA standards cover all household paints, interior and exterior, and also cover painted toys or other articles intended for use by children.

needs program—CEQ's Second Annual Report described the Neighborhood Environmental Evaluation and Decision System (NEEDS), a new approach to identifying and dealing with the pervasive environmental health problems of inner city communities.

NEEDS' first priority is to identify neighborhoods undergoing severe environmental and social deterioration as reflected in pollution, housing, noise, crowding, and health. Then, with the aid of community participation, in-depth physical surveys and household interviews are conducted. The results of the surveys and interviews are analyzed to determine the nature and extent of problems and to serve as a basis for recommending and implementing solutions. NEEDS is administered by BCEM. To date, BCEM has selected neighborhood target areas in 22 cities. Seven cities have completed the survey and interview stage. By the end of fiscal year 1973, this first group of cities will have completed the program analysis stage and will begin implementing recommendations.

radiation

EPA is responsible for setting ambient radiation standards for air and water to protect public health and for advising Federal agencies on radiation matters. In cooperation with HEW, the Atomic Energy Commission (AEC), and the Department of Defense (DOD), EPA is now conducting a major review of all existing Federal radiation protection criteria, standards, guidelines, and policies. The review, which will be finished this year, includes contract efforts with the National Academy of Sciences and the National Council for Radiation Protection and Measurement.

In its 1970 report, *Ocean Dumping—A National Policy,* CEQ said:

> Because of the need to keep all sources of radioactivity at the lowest possible level, ocean disposal of radioactive waste should be avoided except when no alternative offers less harm to man or the environment.

Consistent with this policy, the AEC amended part 20 of its regulations for the dumping of radioactive waste at sea.[64] Under this amendment, the AEC cannot approve any disposal of radioactive materials at sea unless the applicant shows that ocean disposal threatens man or the environment less than other practicable alternatives. Under existing AEC policy no new licenses to dispose of radioactive waste at sea have been issued since 1960. The new amendment buttresses the existing policy.

The AEC has implemented a radioactive effluent reduction program for all AEC-owned facilities. These facilities are already discharging radioactive effluent in concentrations well below Federal radiation guide standards. The Commission has established a program to attempt to reduce radioactivity still further by certain changes in processes and technology. AEC will review and upgrade its monitoring and control of the volume of effluents in order to reduce the total radioactivity from large volume discharges.

The Food and Drug Administration has proposed regulations to equip medical and dental X-ray diagnosis equipment with new control features to cut down patient and operator exposure to radiation during X-ray examination.[65] Ninety percent of all human exposure to manmade radiation comes from the diagnostic use of the X-ray machine. The new regulations would limit the radiation beam to approximately the size of the body area under examination and require certain technical improvements—both to reduce exposure. These changes could reduce the genetically significant dose from diagnostic X-rays by as much as 50 percent or more. The proposed standards would also sharply limit the amount of radiation leakage from X-ray sources and other diagnostic equipment. Previous HEW programs already have had a significant effect on reducing X-ray exposure. (See Chapter 1, on environmental indices.)

solid waste

stimulating recycling—Solid wastes are a growing environmental problem that spawns unsightly open dumps, pollutes air and water, and litters the landscape. Much of its growth stems from mounting production and consumption of materials that eventually become wastes, coupled with a decline in the percentage of material that is reused or recycled.

The key to greater recycling is to improve the economics of waste materials compared to virgin materials. At current solid waste disposal and reclaimed material costs, this may be accomplished by making recycling cheaper or by incentives for the use of waste in consumer products.

industrial development bonds—As directed in the President's 1972 Environmental Message, the Treasury Department's Internal Revenue Service (IRS) has clarified the availability of tax-exempt industrial development bonds for recycling facilities.[66] This ruling permits private firms to use tax-exempt municipal bonds to finance facilities to recycle and dispose of municipal wastes or to recover their own wastes for reuse or for sale to another company. IRS ruled that such bonds qualify for tax-exempt status where a minimum of 65 percent of the material recycled is solid waste.

This clarification will help put recycling on a more favorable footing with traditional disposal methods. By making recycling operations more economically competitive, it will offer an incentive to industry to use its expertise to help solve municipal solid waste disposal problems.

gsa paper recycling—In the past year, GSA has implemented the President's February 1971 directive to step up Federal Government purchase of recycled paper and paper products. GSA now requires that reclaimed fibers ranging from 3 percent to 100 percent be used in most paper and paper product specifications, representing approximately $52 million or 63 percent of annual sales to Federal agencies under GSA paper specifications.

Recycled paper for stationery and reports is usually made from high quality paper mill waste materials (such as envelope clippings) or from high grade homogeneous postconsumer wastes (such as used computer cards). It usually does not include low-grade postconsumer wastes such as newspapers and paper boxes. For example, this report is printed on paper made in part from materials recycled from such sources. Unfortunately such recycling does not now directly attack the major solid waste problem of mixed postconsumer wastes, which must be separated and are likely to contain some contaminants.

An increasing number of GSA-controlled specifications will require a minimum percentage of reclaimed fibers from postconsumer waste resources, that is, those that have been discarded after use by factories, retail stores, office buildings, and homes. GSA has also developed a program to increase the amount of Government-generated wastepaper available for recycling. Several large Federal office buildings are currently segregating recyclable wastepaper into separate wastebaskets. This program is geared to generate greater revenue to the Federal Government from increased wastepaper sales and diminished waste disposal costs. It promotes environmental quality by lessening the quantity of wastes destined for already overburdened landfills and incinerators.

epa solid waste program—EPA's Office of Solid Waste Management is actively promoting solid waste innovations through planning and demonstration grants and technical aid to municipalities. Currently 46 States, 5 interstate agencies, and 8 regional agencies have EPA planning grants to improve the management and financing of waste collection and disposal systems. The emphasis of EPA's solid waste demonstration grant program has shifted from hardware development to improving markets and managerial and institutional practices using currently available technology. Resource recovery—

or recycling—demonstration grants will be keyed to commercially viable systems based on a realistic asssessment of market conditions.

other agencies—To improve the economic attractiveness and technical feasibility of solid waste recycling technology, the Bureau of Mines of the Department of the Interior has supported research and development programs. A Bureau of Mines process for recovery of mineral resources from municipal incinerator residue has been tested successfully at the pilot plant stage and is ready for operation on the demonstration plant scale.

DOT's Federal Highway Administration has mounted a series of demonstration projects using waste products to build and maintain highways. The first phase of this program was to construct, test, and evaluate waste products as roadbuilding materials at TRANSPO 1972, held May 27 to June 4, 1972, at Dulles International Airport near Washington, D.C. One of the parking lots, approximately 100 acres in area, was surfaced with "supersludge," a mixture of fly ash, waste sulfate sludge, and hydrated lime. Also, crushed glass bottles, old shredded rubber tires, and burned garbage were mixed with concrete to pave roads. The Dulles experience will help develop future demonstrations and may eventually show industrial and consumer wastes to be a practical and economically competitive substitute for conventional roadbuilding materials.

noise

pending legislation—In his 1971 Environmental Message, the President proposed a Noise Control Act[67] which would empower EPA to set standards limiting the noise-generation characteristics of construction and transportation equipment and other equipment powered by internal combustion engines. The standards would cover such major sources of noise as automobiles, trucks, motorcycles, compressors, and off-road vehicles. The legislation would also require EPA concurrence on Federal Aviation Administration (FAA) aircraft noise standards. The bill would authorize the Administrator of EPA to require labeling of household products and appliances, such as air conditioners, garbage grinders, and vacuum cleaners. It would also direct EPA to coordinate existing Federal noise research and control programs and to publish criteria and control technology documents relating to noise. The House has passed a bill based primarily on the President's proposals,[68] and the Senate has completed hearings.

epa noise hearings and report—The Clean Air Amendments of 1970 established an Office of Noise Abatement in EPA and required a report to Congress on noise problems and impacts. EPA's report was released early in 1972 after a series of public hearings in eight major cities.[69] It concluded that noise increases the risk of hearing impairment; interferes with conversation, sleep, recreation, and the general quality of American life; and possibly induces lasting physiological effects in people exposed to high levels over a long-term period.

regulatory actions—On August 4, 1971, the Department of Housing and Urban Development (HUD) issued noise abatement and control regulations for its programs.[70] These rules set noise levels for HUD-financed dwelling units and discourage construction of dwelling units on sites that have or are projected to have unacceptable noise exposure. If applicants do not comply with its noise standards, HUD will withhold all forms of aid.

There are a number of instances in which the new HUD policy has prevented noise problems. A proposed new community in the vicinity of the Dallas-Fort Worth International Airport—currently under construction—would have been in the path of noisy jet aircraft. As a result of noise projections made for the airport, the land use plan for the new community was revised to exclude residences and certain other uses from the noisiest areas. In addition, HUD delineated a projected noise zone for the proposed Los Angeles International Airport at Palmdale. The Department will refuse to insure mortgages or give other forms of assistance for incompatible uses in noisy areas around the airport.

HUD has required structural alterations in projects slated for existing urbanized areas to assure quiet inside dwelling units. For example, it required that central air conditioning and double glazed windows be installed in a New York City nursing home as a condition for eligibility for mortgage assistance.

gsa noise abatement—GSA has set maximum allowable noise levels for selected construction equipment at Federal building construction sites. Solicitations for construction bids issued after June 30, 1972, will include noise level limits for equipment such as tractors, bulldozers, power shovels, cranes, derricks, graders, trucks, air compressors, and pneumatic-powered tools. The noise abatement requirements will become progressively tougher at specified future dates. This action will not only have the immediate effect of reducing noise at Federal construction sites but will also spur the development of quieter equipment.

improving land use

national land use policy

In his 1972 Environmental Message to the Congress, the President reaffirmed his commitment to national land use policy legislation and proposed two significant amendments[71] to strengthen the land use policy bill he had proposed in his 1971 Environmental Message.[72] The original legislation would require the States, as a condition of obtaining Federal financial assistance, to assume responsibility for land use decisions which typically have an impact beyond the local jurisdiction where the development decision is made. States would be required to protect areas of critical environmental value such as coastal wetlands and historic districts; control land use around public facilities such as airports, highway interchanges and major recreation areas; and assure that regionally needed development such as water treatment plants or low and moderate income housing is not excluded by local governments.

The amendments which the President proposed in 1972 require that the State agency administering the State land use program have responsibility for site location for major airports, highways, and parks, as well as authority for land use controls around such facilities. States which fail to develop adequate land use programs would lose 7 percent of the Federal highway, airport, and park acquisition funds to which they would otherwise be entitled. The money withdrawn from a State beginning in 1975 could increase to 21 percent by the third year of noncompliance. Such funds would be made available to States complying with the land use policy law. The net effect of the proposed new amendments would be to bring the State land use agency into earlier involvement with the siting and design of facilities affecting regional growth and development.

The Senate Interior Committee has reported a bill largely incorporating the President's 1971 and 1972 proposals.[73] The House Interior Committee has reported a bill with similar land use provisions, but with additional provisions dealing with the public lands.[74]

managing the public lands

Although the Federal Government itself owns approximately 450 million acres of public domain land, it has never been equipped with specific legislation setting forth a policy for its management, retention, and disposal. The basic tools for managing the public domain were forged when Federal ownership was expected to be short-lived and when the Federal role was that of a temporary custodian. The President proposed legislation in 1971, the National Resource Land Management Act,[75] directing the Secretary of the Interior to manage the public domain lands to protect the quality of the environment and declaring a policy in favor of retention of these lands.

tax incentives toward better land use

The President has proposed using the tax laws to provide incentives for better land use decisions. The proposed Environmental Protection Tax Act of 1972[76] would discourage development of the biologically productive coastal wetlands by limiting certain tax deductions for new developments in these areas.

The Act also includes incentives that would minimize the difference in tax treatment between demolition and rehabilitation to encourage more rehabilitation of attractive and historic buildings.[77] Current favorable tax treatment for new construction often leads developers to raze attractive older buildings rather than rehabilitate them, thereby destroying significant buildings and changing the character of neighborhoods.

The President has made proposals to encourage the retention and restoration of historically significant buildings listed on the National Register of Historic Places.[78]

He has also proposed tax deductions for gifts of ecologically and environmentally important lands to nonprofit organizations or to State and local governments. Such deductions would be allowed for all donated conservation related easements—even those granted for less than perpetuity.[79]

other pending land use proposals

The Congress is continuing its review of the Administration's other 1971 proposals for land use controls. These include: the Power Plant Siting Act,[80] which would require long-term planning of sites by utilities and approval of final sites by a State agency; the Mined Area Protection Act,[81] which would require State regulation of surface and underground mining; and the Mining Law [82] and the Mineral Leasing Law [83] both of which would reform Federal mining and mineral leasing practices on public lands.

key federal land use decisions

alaska native claims settlement act—Of Alaska's 375 million acres, 97 percent, or 363 million acres, remains in Federal hands. The Department of the Interior manages about 330 million of those Federal acres—in National Parks, National Monuments, Wildlife Refuges and Ranges, and unappropriated public domain. Other Federal holdings include National Forests, administered by the Department of Agriculture, and areas set aside for the armed forces.

The 1958 Act that gave Alaska its Statehood [84] said that the State could select up to 103 million acres for its own needs, a large portion of which has already been selected. The 1971 Alaska Native Claims Settlement Act [85] provided that the Native Alaskans (approximately 90,000 Indians, Eskimos and Aleuts, of which 55,000 still live in Alaska) could select 40 million acres in fee title and receive $962.5 million over a period of years in settlement of their aboriginal claims.

The 1971 Act gave the Secretary of the Interior 90 days from its effective date, December 18, 1971, to review Alaska's unreserved public lands and determine whether any portion of these lands should be withdrawn. It also directs the Secretary to make withdrawals of up to 80 million acres of land which he finds suitable for addition to or creation as units of the National Park, National Forest, Wildlife Refuge, and Wild and Scenic Rivers Systems.

On March 9, 1972, the Secretary withdrew 80 million acres for further study of their suitability for these four systems.[86] He also withdrew an additional 45 million acres from all appropriation except metalliferous mining. These lands embrace acreages potentially valuable for a wide variety of possible uses, including any of the four systems, multiple use for timber and minerals management, hunting, and recreation. They will be studied for disposal or retention by the Federal Government.

Finally, the Secretary withdrew some 40 million more acres for native selections in addition to the 59 million acres already withdrawn by the Act. This gives the natives some 99 million acres from which to choose their final 40 million acres. Some of the remainder thereafter could be selected by the State. The Native Claims Act also established a Joint Federal-State Land-Use Planning Commission, which is critical to sound land use planning in Alaska.

alaska pipeline—On May 11, 1972, after more than 2 years of study and the filing of a multivolume final environmental impact statement, the Secretary of the Interior announced his decision to grant a right-of-way permit to a private consortium of oil companies to build a trans-Alaska pipeline. The Secretary considered an alternate route through Canada, but noted that some environmental risks would be involved with either route. He pledged that the Department would take strict measures to minimize potential pollution from the Alaskan pipeline. He also said that the Alaska route was in our best national interest because it would guarantee the quickest delivery of oil to the west coast through a secure pipeline located under the total jurisdiction and for the exclusive use of the United States.

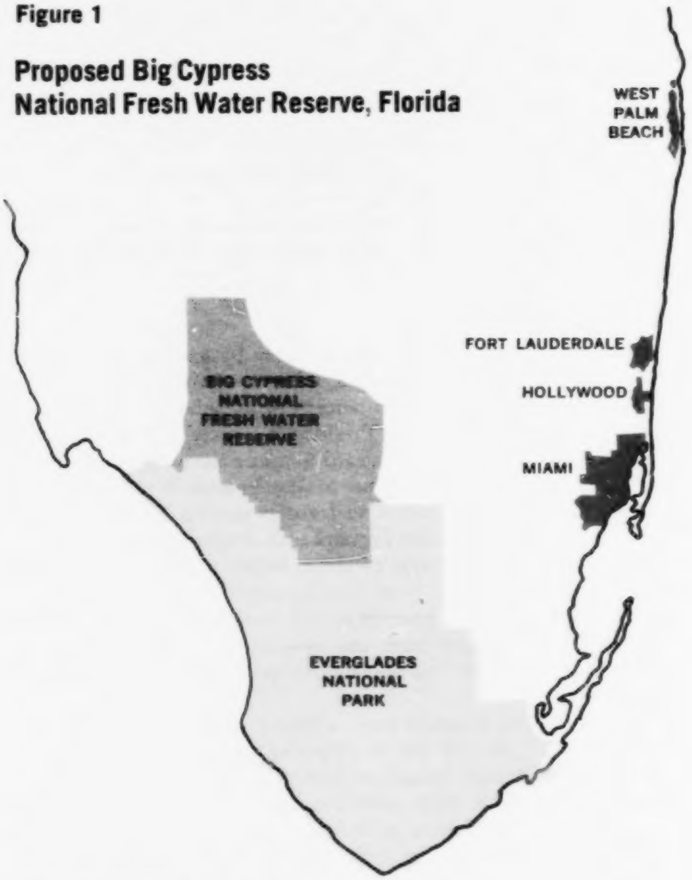
Whether the permit is actually granted hinges now on the resolution of a court injunction against the Secretary which halted further construction of a road necessary to lay the pipeline.

big cypress—In November 1971 the President announced a proposal to acquire sufficient Federal legal interest in the Big Cypress Swamp north of Everglades National Park in Florida to protect it from private development.[87] More than half of the ground water flowing into Everglades National Park comes from the Big Cypress, and the Park's preservation depends upon this supply of fresh water. Aside from its importance to the Park, the Big Cypress also provides the critical water supply for much of the southern Florida Gulf coast which has important aesthetic and economic features. The larger ecosystem of which Big Cypress is a part is the Nation's only significant subtropical marsh area.

Under the President's proposal, the Secretary of the Interior would acquire interest in up to 547,000 acres of private land and approximately 37,000 acres of publicly owned land, to be known as the Big Cypress National Fresh Water Reserve. The Reserve would be administered by the Secretary of the Interior in accordance with the laws applicable to the National Park System or by State or local governments if they agree to a number of conditions for protecting the swamp's unique natural environment. Some portions would be managed as scientific, ecological study areas, and acquisition would preserve important habitat for at least nine endangered species of wildlife as well as many species of exotic plants and flowers. (See Figure 1, a map of the Big Cypress National Fresh Water Reserve and the Everglades National Park.)

Figure 1

Proposed Big Cypress National Fresh Water Reserve, Florida


WEST PALM BEACH
FORT LAUDERDALE
HOLLYWOOD
MIAMI
BIG CYPRESS NATIONAL FRESH WATER RESERVE
EVERGLADES NATIONAL PARK

Source: Department of the Interior

preserving our natural heritage

national parks centennial

The National Parks System celebrates its centennial year in 1972. Beginning with Yellowstone National Park 100 years ago, the system has grown to embrace 285 National Parks and Monuments, National Recreation Areas, National Seashores, Historic Sites, and other areas. By 1971 the National Park System covered 30 million acres of federally owned land in 47 States, the District of Columbia, Puerto Rico, and the Virgin Islands and served over 201 million visitors.

On January 5, President Nixon proclaimed 1972 as the National Parks Centennial Year and called upon all Americans to take part in centennial events. The year is being celebrated with banquets, exhibitions, symposia, and five centennial commemorative stamps.

From September 21–27, 1972, at Grand Teton National Park, more than 500 representatives from almost 90 nations will take part in the Second World Conference on National Parks. They will exchange ideas and information from around the globe. The conference will be sponsored by the 15-member Centennial Commission and the International Union for the Conservation of Nature and Natural Resources. Prior to the conference, ceremonies will be held at Yellowstone to commemorate the 100th anniversary of the first National Park.

legacy of parks

In urban America, where 7 out of every 10 Americans live on 1.5 percent of the Nation's land area, only one-fourth of the Nation's recreation facilities and only 3 percent of its public recreation lands are reasonably accessible. The President's Legacy of Parks Program, initiated early in 1971, was intended to insure the availability of open space and recreational areas closer to where people live. The program includes an accelerated effort to transfer surplus Federal lands to State and local governments for park and recreation use.

Before the legacy of parks program began, surplus Federal lands could be turned over to State and local governments for park use only if purchased at 50 percent of fair market value. As a result of new legislation, Federal lands can now be transferred to State and local park jurisdictions at a discount of up to 100 percent of their fair market value.

The President's Property Review Board, established by Executive Order 11508 [88] has the job of searching for underutilized Federal lands which may have recreation potential. As of June 28, 1972, 144 properties had been made available for recreational use, covering approximately 20,000 acres in 39 States and Puerto Rico. Their estimated fair market value is over $98 million. Most of them are located in and near cities, where the need for open space is greatest.

Another major facet of the Legacy is the Interior Department's Land and Water Conservation Fund. In fiscal year 1972 appropriations for the Fund's multiple activities totaled $365 million, some $255 million of which was matched with State and local funds for comprehensive recreation planning, land acquisition, and facility development.

The fund is also providing $101 million for Federal agencies to buy land to preserve our natural and historic heritage in National Parks, Recreation Areas, Historic Sites, Wildlife Refuges, and Wild and Scenic Rivers and Trails. The fiscal year 1973 budget calls for expenditures of nearly $200 million for the State grant-in-aid program and nearly $100 million for authorized Federal land acquisition.

Cash obligations for the entire life of the fund's grant program have reached the $1 billion mark, $500 million of it in State and local matching funds. More than 7,500 projects have been approved by Interior's Bureau of Outdoor Recreation—over half approved since early 1969.

Several closely related HUD programs (open space land, urban beautification, and historic preservation) have been replaced by a single comprehensive aid program. The new consolidated open space program enables HUD to provide assistance to State and local governments from a single source for the full range of activities included in park acquisition and development, for environmental improvements on publicly owned or controlled land, and for preservation of historic buildings and sites.

Complementing his May 1971 proposal to establish a 23,000-acre Gateway National Recreation Area in the New York City area, which has passed both Houses and is awaiting conference, the President has now proposed a Golden Gate National Recreation Area in California's San Francisco Bay region.[89] With Congressional approval, two of the Nation's most scenic gateways—each with valuable cultural, historic and recreational assets and each accessible to millions of people—will become available for widespread use. The Golden Gate Recreation Area would run along 30 miles of beautiful beaches and coastline north and south of the Golden Gate Bridge with boundaries embracing some 24,000 acres of existing State and county parkland, undeveloped military reservations, and private lands. (See Figure 2, a map of the proposed boundaries of the Golden Gate National Recreation Area.)

off-road vehicles

In his Environmental Message of 1972, the President announced the issuance of an Executive Order imposing controls over the use of off-road vehicles (ORV's) on public lands.[90] In the last few years the number of motorcycles, trail bikes, dune buggies, swamp buggies, snowmobiles, all-terrain vehicles, and other ORV's has multiplied to over 5 million. The Department of the Interior's Bureau of Outdoor Recreation predicts that ownership and use will continue to grow at a dramatic rate.[91] The President's Executive Order recognizes that ORV's are a legitimate form of outdoor recreation when used responsibly. But too often these vehicles are operated far from developed trails and roads, damaging fragile ecological areas, disrupting wildlife in their natural setting, and conflicting with recreational uses that require solitude. Noisy ORV's conflict sharply with more traditional uses of natural areas by hikers, backpackers, horseback riders, and campers. Under the Executive Order, heads of Federal land management agencies must develop, by August 1972, regulations for ORV usage aimed at lessening damage to natural resources and wildlife and minimizing conflicts with other recreation uses. The agencies will designate areas where ORV's may or may not be used and will specify operating conditions.

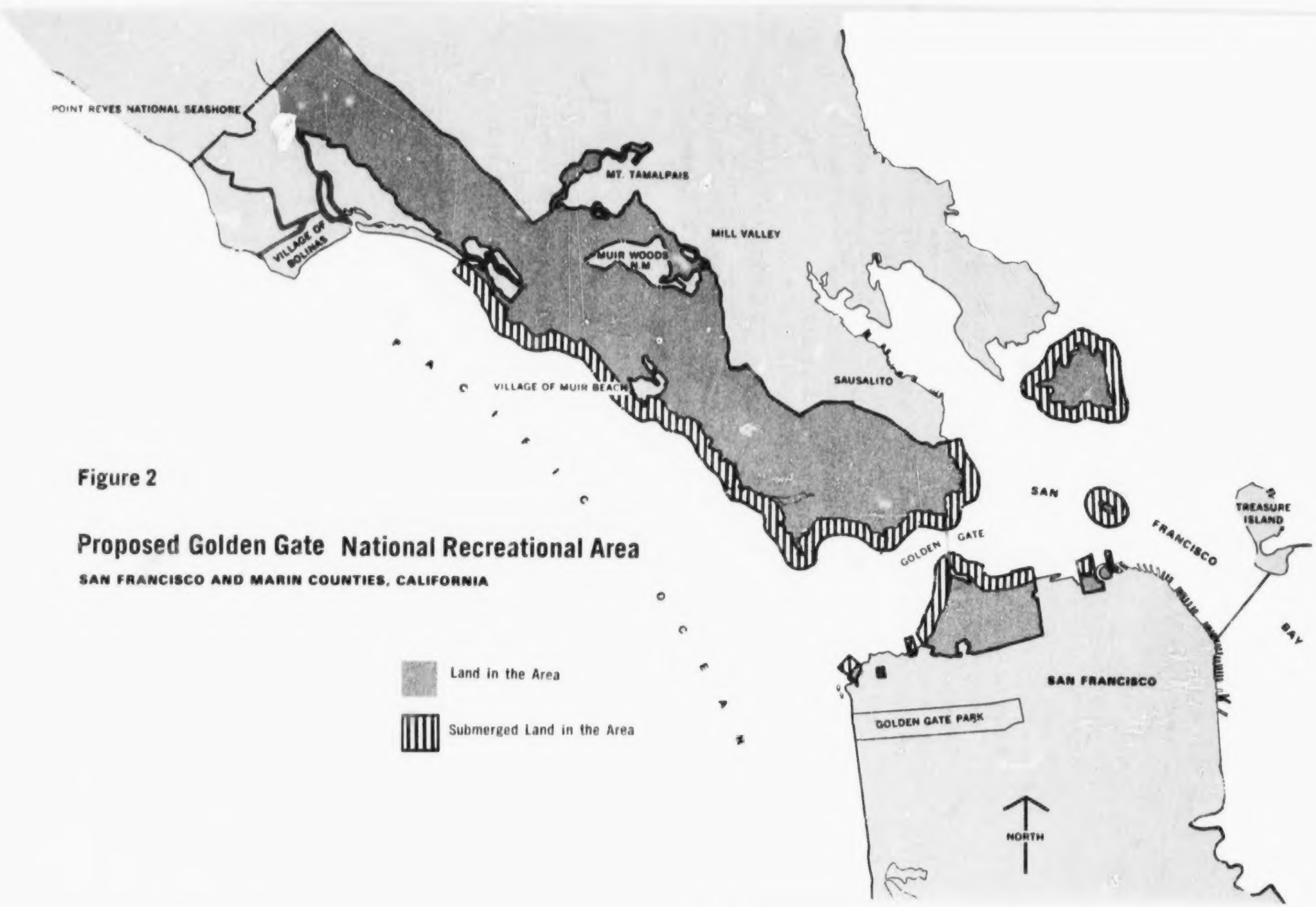

POINT REYES NATIONAL SEASHORE
VILLAGE OF BOLINAS
MT. TAMALPAIS
MILL VALLEY
MUIR WOODS N.M
VILLAGE OF MUIR BEACH
SAUSALITO
PACIFIC OCEAN
SAN FRANCISCO BAY
TREASURE ISLAND
GOLDEN GATE
SAN FRANCISCO
GOLDEN GATE PARK
NORTH
Land in the Area
Submerged Land in the Area

Figure 2

Proposed Golden Gate National Recreational Area

SAN FRANCISCO AND MARIN COUNTIES, CALIFORNIA

wilderness areas

The 1964 Wilderness Act [92] set aside 54 areas consisting of about 9.1 million acres of land, mostly in the Western States. Since then, some 35 new areas—about 1.3 million acres—have been added. In his 1971 Wilderness Message, the President endorsed all 13 areas proposed to the Congress by the previous Administration and proposed 14 new areas. Subsequently, four other areas have been proposed to the Congress. Two of the 31 proposed areas have been designated as wilderness by Congress.[93] The other 29, comprising several million acres, have not been enacted.

In 1972, 18 new areas were proposed, which would add another 1.3 million acres to the Wilderness System. Eight lie within National Forests, four within National Parks, and six within National Wildlife Refuges. Congressional approval of all pending proposals would bring the Wilderness System to a total of 15.2 million acres.

Unfortunately, few of these wilderness areas are in the Eastern United States, where most of the people live. In his 1972 Environmental Message, the President directed the Secretaries of Agriculture and the Interior to identify areas in the East that have Wilderness potential. He also announced that the program for review and recommendations of new additions to the National Wilderness System has been brought back on schedule and that the 1974 deadline will be met.

wildlife

predator control—The widespread use of highly toxic poisons in predator control programs, particularly on public lands in the West, has been of increasing concern to the public, conservation groups, and Federal land managers. These poisons endanger beneficial birds and animals and disrupt the ecosystem.

Last year the Council on Environmental Quality and the Department of the Interior appointed an Advisory Committee on Predator Control to study the entire issue of predator and related animal control activities. In its report, *Predator Control—1971*, the Committee found that persistent poisons have been applied to range and forest lands without adequate knowledge of how they affect the ecology or whether they actually prevent loss of livestock.[94] The large-scale use of poisons for control of predators and field rodents has unintentionally killed other animals and damaged natural ecosystems. The Committee concluded that necessary control of coyotes and other predators can be accomplished by methods other than poisons.

On the basis of this report, the President issued an Executive Order [95] barring, with certain exceptions, the use of poisions for predator control on all Federal lands. Also, EPA has suspended and cancelled registrations for poisons used in predator control.[96] EPA's action covers all uses of the poison "1080" and predator control uses of cyanide and strychnine. The President has also proposed legislation [97] to shift the emphasis of the current Federal predator control program to one of research and technical and financial aid to control predator populations by means other than poisons. The proposed legislation, passed by the House would repeal the Act of March 2, 1931,[98] authorizing the control of predatory animals on Federal lands.

endangered species—Nearly 400 species are currently listed as endangered, either in the United States or worldwide. Although there are some species once threatened with extinction that are now thought to have been saved, the threat remains and can be expected to grow in intensity as habitat is converted to human use. CEQ warned in its Second Annual Report that "from the available evidence, it would appear that populations of many—but by no means all—species of nongame wildlife are declining to some degree."

In his 1972 Environmental Message, the President proposed legislation that would, for the first time, make the taking of an endangered species a Federal crime.[99] The law would extend the definition of "endangered" to include forms which are "likely to become endangered," permitting action to be taken before species are on the critical list. The proposed legislation would also enable an international species to be listed if it is threatened throughout a significant portion of its range.

Within the past year the United States has halted all harvesting of whales and commerce in whales and whale products. The Secretary of the Interior placed all eight commercial species on the endangered species list, prohibiting imports of whale products into the United States.[100] The Secretary of Commerce denied the license renewal application of the last remaining U.S. whaling operation, ending this country's long whaling history.[101] (See Chapter 3, on international aspects of the environment, for a fuller discussion of marine mammal protective activities.)

environmental research

In 1972, for the first time, the President sent a Science and Technology Message to the Congress.[102] The message, coupled with 1973 budget requests, reflects a new priority for meeting civilian needs—including environmental needs—with technology while military and space-oriented research programs are winding down.

In his 1973 budget, the President announced an $88 million increase in energy research, or 22 percent over fiscal year 1972. The total of $450 million would be targeted to developing new, cleaner energy sources, such as the liquid metal fast-breeder reactor, and for converting coal into pipeline quality gas. It also will fund research on fusion power, solar energy, and magnetohydrodynamics.

The President also announced stepped-up research in other areas. As discussed earlier, he initiated a new research and demonstration program for integrated pest management. The fiscal year 1973 DOT budget requests over $19 million research and development funds to reduce airplane noise, compared to only $8 million in fiscal year 1972. The National Aeronautics and Space Administration has requested

$12 million in fiscal year 1973 for aircraft noise reduction research. DOT's fiscal year 1973 budget also calls for $17 million for urban mass transit research and development stressing improved bus design and operations, bus pollution control, and new transit techniques.

On January 31, 1972,[103] the President transmitted to the Congress a joint HEW–EPA study on the health effects of environmental pollution. The report concluded that the Nation needs more research on identifying agents entering the environment and on assessing their toxicity and impacts on biological systems. Intensified efforts also are needed to find ways to test new agents before they are widely distributed and to develop a scientific understanding of the effects of combinations of chemicals. The fiscal year 1973 budget has funds set aside to gain a better scientific understanding of the effects of environmental pollutants on human health. Research on the health effects of pollutants was singled out for special emphasis, with a proposed increase from $115 to $154 million—or 35 percent—from fiscal year 1972 to fiscal year 1973. Sizable portions of the new money will be given to EPA to study the health effects of air pollutants and to HEW's National Institutes of Health to consider the carcinogenic properties of chemicals.

The National Science Foundation's research and development program will increase from $486 million in 1972 to $563 million in 1973, focusing funds on projects aimed at better understanding of the environmental sciences and at advanced technologies, such as solar power.

Research designed to better understand the impact of pollution upon ecological processes continues to receive high priority from Federal agencies. The National Oceanic and Atmospheric Administration (NOAA) has a number of programs underway. Working with the Smithsonian Institution, the Department of the Interior, and others, NOAA marine biologists have developed a comprehensive long-term program of marine mammal research. These efforts combine Federal research with those of the nongovernment scientific and academic community. Generated at the 1971 International Conference on the Biology of Whales, the NOAA program recognizes that we currently have only scant basic scientific knowledge about whales. NOAA is expanding its research and development efforts on ocean processes and marine resources. Studies will probe environmental problems in the world's oceans and focus on selected nearshore ocean areas. NOAA is also studying various aspects of weather modification, including research into mitigation of the intensity of hurricanes, snowfall redistribution, and the allevation of drought. Mathematical models of climate modification and of broader circulation of the atmosphere and the oceans are being developed to augment the research effort.

The National Bureau of Standards assisted EPA in measuring the scope and magnitude of noise as an environmental problem and is working with the AEC to develop standard procedures for measuring and assessing environmental deposits of trace levels of radioactivity produced by nuclear power reactors.

A number of agencies are concerned with developing better methods to prevent and clean up oil spills. In 1972 EPA spent $3.9 million on research on the effects of oil and hazardous materials spills, and on technology for controlling them. EPA also constructed an oil and hazardous materials test basin at its laboratory in Edison, N.J. The Coast Guard has supported the development of oil spill containment devices and has tested prototypes on the high seas. The Coast Guard, Maritime Administration, and Navy Department have also conducted research into oil-water separators, tank membranes, tanker design, and other technological innovations to minimize the discharge of oil.

DOT is conducting an assessment of the meteorological and environmental effects of high altitude aircraft. Under its Climatic Impact Assessment program (CIAP), DOT is investigating the complex interactions between aircraft emissions in the upper atmosphere, the chemistry of the natural components of the stratosphere, and the dynamic motions of the upper atmosphere, including dispersion and transport. In the past year, CIAP has started measuring engine exhaust emissions under simulated cruise conditions; sponsored global measurements of ozone, water vapor, and particulates from high altitude balloons; developed new high sensitivity apparatus for measuring nitric oxide at high altitudes; and obtained new measurements of reactions of ozone with other elements in the upper atmosphere. The results of the CIAP assessment will be reported in 1974.

Last year's Annual Report discussed the conversion of part of the Pine Bluff Arsenal in Arkansas from a biological warfare materials development facility to a National Center for Toxicological Research. That facility, jointly administered by the Food and Drug Administration and EPA, has started to develop protocols (procedures for conducting tests) to examine the biological effects on test animals of low doses of chemical substances over long periods of time.

The Atomic Energy Commission's new aquatic ecology facility at the Oak Ridge National Laboratory (ORNL) in Tennessee is analyzing the impact of thermal discharges from powerplants on fish and other aquatic life. Through such research, ORNL scientists hope to be able to predict possible adverse or beneficial environmental impacts from thermal discharges for use in assessing individual nuclear powerplants. This type of practical data will be particularly useful in picking sites for plants or designing cooling systems. ORNL will also study the interactions of temperature and radioactivity on aquatic organisms.

In a survey of Federal ecological research, the CEQ-Federal Council for Science and Technology (FCST) Committee on Ecological Research reported a 26-percent increase in Federal support of ecological research between fiscal year 1971 and fiscal year 1973. The research focused on ecosystems functions, interactions between organisms and their physical and chemical environments, and the impact of man and his technology on natural systems. Most of the increased research aims to help resolve specific ecological and environmental problems. Because serious gaps in knowledge still exist, CEQ and FCST are jointly identifying the major national goals in ecological research.

NOAA, EPA, DOT, DOD, and Interior are working on a joint U.S.-Canadian program of environmental and water resources research for the Great Lakes. This effort is expected to develop a sounder scientific basis for Great Lakes water resources management and to aid in solving problems of water quality and supply.

environmental education and training

The spectrum of environmental education extends from training thousands of environmental scientists, engineers, and technicians to increasing the general public's awareness and understanding of environmental problems.

EPA's training grant programs cover the fields of air and water quality, radiation, and solid waste. Grants are awarded to colleges and universities with heavy emphasis on the education of master's and doctoral level professionals. In fiscal year 1972, EPA budgeted over $10 million for graduate education grants for 114 university and 22 other programs, with more than one-half of the total designated for water quality. EPA environmental education efforts also encompass grants to undergraduate and secondary schools, as well as public information services.

Under the Environmental Education Act of 1970,[104] the Office of Environmental Education (OEE), a division of HEW's Office of Education (OE), administers a wide-ranging grant program. The program funds projects in training, curriculum development, community education, State planning, and evaluation of environmental education activities. In the past year, OEE has awarded grants for projects as diverse as neighborhood recycling education centers and comprehensive environmental education planning at the junior high school level. In fiscal year 1972, OEE budgeted $3 million for grants under the Act and augmented its environmental education efforts with $11.2 million in additional funds from other OE programs.

In fiscal year 1971, the National Science Foundation (NSF) supported projects amounting to $5.7 million in areas related to environmental education. These efforts include student and instructor training and curriculum development for elementary and secondary schools, as well as colleges and universities.

The Department of the Interior's National Park Service has developed a three-pronged approach to environment education. Its National Environmental Education Development (NEED) program develops and distributes curriculum materials on environmental problems and processes to elementary, junior high, and high schools.

NEED materials for sixth grade classes are already available. Materials for other grades will be completed and published later this year and in 1973. The Park Service has also designated 80 National Environmental Study Areas (NESA) within the National Park System. Through a cooperative program with the U.S. Office of Education, the National Education Association, and local school systems, these areas are available to students and teachers to examine in a natural setting the relationships of man to the natural environment. In a related effort to preserve naturally significant environment study areas not under Federal jurisdiction, the Park Service designates National Environmental Education Landmarks (NEEL). To date 11 such areas have been identified under the NEEL program.

the president's environmental merit awards program

In October 1971 the President initiated an environmental merit awards program to recognize environmental services by youth throughout the country. The awards are given to students at elementary, junior high, and high school levels for outstanding environmental projects. On April 20, 1972, the President established by Executive Order an Advisory Committee to the awards program.[105] Awards for particularly significant projects are presented by members of the President's Advisory Committee.

Environmental service awards recognize two levels of accomplishment. The first level (certificate of merit) is granted to all students or student groups who undertake and complete a responsible environmental service project. The second level (award of excellence) is awarded for projects considered by a judging panel to merit special recognition for achievement. Projects that have received awards include recycling centers, cleanup drives, tree plantings, and studies of local pollution problems. In a number of cases, student projects have resulted in new environmental ordinances or other community actions.

As of June 8, 1972, the program had awarded 2,154 certificates of merit and 1,969 awards of excellence. At the Federal level, the program is administered through the Environmental Protection Agency and the Office of Education.

environmental reorganization—a progress report

Last year's Annual Report described the 1970 organizational innovations that created both EPA and NOAA. During the past year both agencies have translated the underlying objectives of improved focus and coordination into specific action. This chapter has discussed many of their accomplishments.

On March 25, 1971, the President proposed legislation to establish a Department of Natural Resources (DNR), bringing together all of the major Federal programs concerned with energy, water, land, and other natural resources.[106] The Department would consist of five major parts: land and recreation resources; water resources; energy and mineral resources; oceanic, atmospheric, and earth sciences; and Indian and territorial affairs.

The Department would include all programs now in the Department of the Interior, plus a number from other agencies. From the Agriculture Department, it would embrace the Forest Service, the Soil Conservation Service, relevant sections of the Economic Research Service, and the soil and water conservation research functions of the Agricultural Research Service. Policy and planning functions of the Army Corps of Engineers would be transferred to DNR, as would civilian power functions of the Atomic Energy Commission and pipeline safety functions of the Department of Transportation. All of NOAA and the Water Resources Council would be transferred to DNR.

This proposal for better organization and direction of the Federal Government's natural resource programs still awaits Congressional action. Only one hearing has been conducted by the Senate and none by the House.

supreme court environmental decisions

As the chapter on Law and the Environment of CEQ's 1971 Annual Report indicated, the lower Federal courts have been carrying a heavy load of environmental litigation, particularly of cases involving the National Environmental Policy Act (NEPA). Environmental litigation continued at an even higher level during this past year, as Chapter 7 of this year's report, on NEPA, illustrates. There were also a significant number of decisions in environmental cases by the U.S. Supreme Court this year. These decisions deserve special attention because they carry important implications both for the substantive development of the law in several areas and for future Federal-State relations in environmental control activities.

The Supreme Court's 1971 term opened when the Court denied a temporary injunction to stop the AEC from carrying out a scheduled underground nuclear explosion code named Cannikin on Amchitka Island, Alaska. In *Committee for Nuclear Responsibility* v. *Schlesinger*,[107] the test was challenged on the grounds that the NEPA environmental impact statement was inadequate. Both trial and appellate courts had refused to grant temporary injunctions against the test. The Supreme Court's decision came at noon on the day that the request was considered. Later that afternoon the test was carried out. Beset by unusual time pressures the Court, by a close decision, refused to delay the test for a determination of the adequacy of the environmental impact statement.

Next, in *Sierra Club* v. *Morton* (the *Mineral King* case),[108] the Court heard a challenge to the legality of a ski resort development on Federal land in California's Sierra Nevada Mountains. Rather than dealing with the merits of the action, the Court held that the Sierra Club had not established the statutorily required interest in the area to have standing to press its claims. The Court did, however, confirm that environmental grounds were a basis for challenging Federal actions and that plaintiffs would have standing if they could prove they were damaged by actions of the Government. The case is discussed further in Chapter 7, on NEPA.

Problems of Federal-State conflict in setting environmental standards for radiation emissions next drew the Court's attention. In *Northern States Power Co.* v. *Minnesota*,[109] the Supreme Court affirmed a decision of the Court of Appeals for the Eighth Circuit which held that nuclear-fueled electric generating plants are subject only to radiation regulations imposed by the Atomic Energy Commission under the Atomic Energy Act of 1954 [110] and not to stricter State regulations.

In *Illinois* v. *City of Milwaukee*,[111] the Court refused to permit Illinois to file an original complaint in the Supreme Court against four Wisconsin cities and two local sewerage commissions. Illinois charged that these Wisconsin cities and sewerage commissions were causing pollution of its water.

Under the Constitution the Supreme Court must take jurisdiction as a trial court when one State sues another. But in this case, the Court was able to refuse jurisdiction by holding that political subdivisions of a State (i.e., the Wisconsin cities and sewerage commissions) should not be considered as States for purposes of mandatory Supreme Court jurisdiction. Nonetheless, it held that a Federal district court in Wisconsin did have jurisdiction to hear Illinois' claim. The Supreme Court then laid down guidelines for the Federal district court's consideration of the case. It stated that political subdivisions of Wisconsin have a duty to abate pollution of interstate waters or of the air in an identifiable interstate watershed. The Federal district court could enforce this duty under a Federal common law of nuisance.

The opinion spoke only of the "government's" use of the newly articulated common law remedy. Thus, the opinion suggests that while private citizens may be unable to use this remedy, it clearly is available to States and may well be available to the Federal Government. This decision could involve the Federal district courts in antipollution cases in a major new way.

After the *Illinois* decision was announced, the Justice Department amended its complaint against the Reserve Minin [illegible]. of Minnesota (discussed earlier in this chapter), originally filed under the Federal Water Pollution Control Act and the Refuse Act of 1899, to include a cause of action based upon the Federal common law enunciated in *Illinois* v. *City of Milwaukee*. Thus, the Justice Department has indicated that it hopes to participate actively in developing the new Federal common law of nuisance.

During this past year, the Supreme Court has taken some careful steps to define its role and the role of the Federal judiciary in environmental law. It made an important contribution to the law of standing by affirming the right of plaintiffs to challenge Federal actions on environmental grounds (*Mineral King*). And it has opened a whole new area of Federal common law (*Illinois* v. *Milwaukee*).

congressional activities

This chapter has discussed numerous pending Presidential environmental proposals at various stages of Congressional review and action. The Ninety-second Congress has enacted only three of the many legislative initiatives proposed by the President. These include two laws which should help to reduce vessel collisions and resultant spills of oil or hazardous substances—the Ports and Waterways Safety Act,[112] which gives the Coast Guard authority to establish vessel traffic control systems in our busy harbors and coastal waters, and the Vessel Bridge-to-Bridge Radio-Telecommunications Act,[113] which requires radiotelephone communications between ships. A third, the Surplus Property Act Amendments,[114] provides that Federal historic properties transferred to States and localities may be used commercially, thus enhancing their economic viability and offsetting restoration expenses.

Figure 3 summarizes the status of Congressional actions on water quality, pesticides, toxic substances, land use, and other environmental legislation proposed by the President.

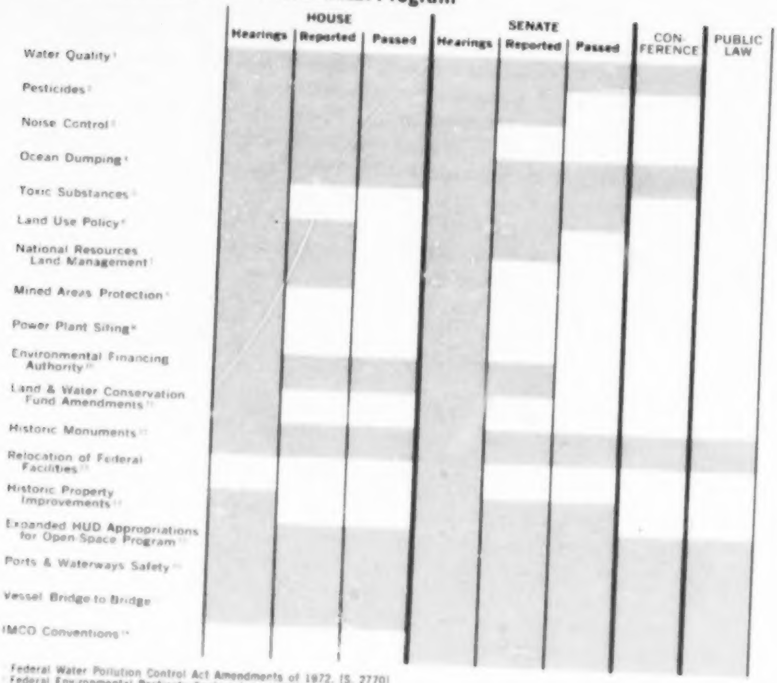
The Congress has acted upon a number of other environmental measures, particularly proposals to protect various species of animals. In the wake of disclosures of widespread aerial shooting of eagles, Congress enacted a law making it a crime for any private person to shoot, harass, or hunt any bird, fish, or other animal from an airplane.[115] That Act sets maximum penalties of up to $15,000 in fines and a year in prison for violations. The Congress also enacted a measure to protect wild horses and burros on public lands.[116] The Act brings the animals under the jurisdiction of the Interior Department's Bureau of Land Management and the Agriculture Department's Forest Service. Generally, these animals are not to be destroyed even if they stray on private lands, and violators can be penalized up to $2,000 in fines and a year in jail.

Both Houses have passed a bill which would establish a National Environmental Data System and State environmental centers.[117] The national system would serve as a central referral and coordinating facility for environmental data. The State centers would coordinate and combine environmentally related research and education capabilities within each State (or region if States wished to establish joint centers).

The Senate has passed and sent to the House a bill establishing a national policy for management, use, and protection of the Nation's coastal zones.[118] The bill would authorize Federal grants to encourage States to prepare management programs to preserve, develop, and restore coastal zone resources. Areas covered by the bill include beaches, salt marshes, wetlands, harbors, bays, and adjacent lands. The House has passed legislation calling for a 5-year moratorium on

Figure 3

Status of the Legislative Components of the 1971 Presidential Environmental Program



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[1] Federal Water Pollution Control Act Amendments of 1972. [S. 2770]

[2] Federal Environmental Pesticide Control Act of 1971. [H.R. 10729]

[3] Noise Control Act of 1971. [H.R. 11021]

[4] Marine Protection Act of 1971. [H.R. 9727]

[5] Toxic Substances Control Act of 1971. [S. 1478]

[6] National Land Use Policy Act of 1971. [S. 632-H.R. 7211]

[7] National Resource Land Management Act of 1971. [S. 632-H.R. 7211]

[8] Mined Areas Protection Act of 1971. [S. 993-H.R. 4704]

[9] Power Plant Siting Act of 1971. [H.R. 11066]

[10] Environmental Financing Act of 1971. Provisions included in Water Quality legislation in the House of Representatives. [S. 1015]

[11] Amendments to the Land & Water Conservation Fund Act of 1965, as amended. [S. 990-H.R. 4705]

[12] Amendments to Surplus Property Act of 1944 and Federal Property and Administrative Services Act of 1949 to facilitate the preservation of historic monuments. [S. 1152]

[13] Authorization of Expenses for Relocation of Federal Facilities. [S. 1153]

[14] Amendment to National Housing Act on insurance of loans for improvement of residential historic properties. [S. 3248-Omnibus Housing Act]

[15] Expanded HUD Appropriations for Open Spaces Program. [P.L. 92-213]

[16] Ports & Waterways Safety Act. [P.L. 92-340]

[17] Vessel Bridge to Bridge Radiotelephone Act. [P.L. 92-63]

[18] Requires Senate action only. IMCO Liability Convention (Civil Liability for Oil Pollution Damage) being held at the Desk for further action. Amendments to 1954 Oil Spill Convention and IMCO Intervention Convention (Intervention on High Seas in cases of Oil Spills) approved by the Senate.

the killing of ocean mammals and on the importation of their products.[119] The Act would apply to seals, sea lions, whales, porpoises, dolphins, sea otters, manatees, walruses, and polar bears. The Senate Commerce Committee has reported a bill that would establish a 15-year moratorium on the taking of marine mammals.[120] Both Houses have passed resolutions requesting the Secretary of State to call for an international moratorium of 10 years on the killing of all species of whales.[121]

The Congress in the past year has continued its factfinding and oversight hearings on environmental activities of the executive branch. Among other topics, these hearings have dealt with amendments to NEPA, implementation of the Clean Air Act, lead in paint, national energy needs and resources, long-range energy research, deep port development, implementation of the Environmental Education Act, the U.N. Conference on the Human Environment, and the proposed trans-Alaska pipeline.

ceq activities

The Council on Environmental Quality has continued in the past year to: work with Federal agencies in carrying out the obligations of NEPA, coordinate Federal environmental activities, advise the President on environmental policy issues, and inform Congress and the public of major environmental matters through this Annual Report on environmental quality and various special reports. CEQ, assisted by many agencies, shaped the legislative and administrative action program submitted to the Congress by the President in his 1972 Environmental Message. The 1972 message contained 16 major proposals ranging from the new predator control Executive Order to a tax on sulfur oxide emissions.

The Council, jointly with EPA and the Department of Commerce, published *The Economic Impact of Pollution Control,*[122] a preliminary assessment of the economic impacts of air and water pollution abatement requirements on selected industries and on the U.S. economy as a whole. A summary of this report is reprinted in Chapter 8. A soon-to-be-published report on integrated pest management describes many promising alternative techniques to minimize the use of chemicals in pest control, impediments to their adoption, and the administration's program to promote greater use of these techniques. The Council also released a report prepared for it, *The Quiet Revolution in Land Use Control,*[123] and together with the Department of the Interior, another report, *Predator Control—1971.*[124] *The Quiet Revolution* reviewed the progressive developments and actions to control land use in a number of States and regional areas. The predator control report is discussed earlier in this chapter. A report on PCB's,[125] also discussed earlier in this chapter, was prepared by an interagency task force under joint CEQ-OST leadership.

In March 1972 CEQ cosponsored with EPA and the Council of State Governments a national symposium on State environmental legislation. (See Chapter 5 for a discussion of the symposium.) Six major studies are currently underway at the Council. A study on energy and the environment will deal with the environmental impacts of energy activities. A study on recycling will analyze the environmental, technological, and economic aspects of resource recovery. A case study of the Delaware River Basin will analyze how environmental problems developed in this area and how the future of the region will be affected. Studies on environmental monitoring aim to develop indices of a variety of aspects of environmental quality. A fifth study, on the environmental effects of deep water port facilities, will provide an environmental framework for Federal decisionmaking on receiving supertankers in U.S. waters. A sixth, on stream channelization, is an environmental, economic, and financial assessment of a variety of channel modification projects carried out by the Army Corps of Engineers, the Soil Conservation Service, the Bureau of Reclamation, and the Tennessee Valley Authority.

A discussion of environmental impact statements and the Council's role in this area can be found in Chapter 7 of this report. The Council has expedited public notice of environmental impact statement filings by publishing in the Saturday *Federal Register* weekly lists of statements received. The *102 Monitor,*[126] published monthly, also reports on statements filed and gives other background information. Finally, CEQ has arranged with the National Technical Information Service (NTIS) and the *Environmental Law Reporter* (ELR) to provide copies of environmental impact statements to the public at a reasonable price.[127]

conclusions

The past year has been one of action, consideration, and new initiatives. The Congress, involved primarily in debate on a multitude of environmental proposals, has yet to take final action on most of the important initiatives before it. On the administrative side, EPA moved to implement the Clean Air Amendments of 1970 with a number of major regulatory and standard-setting actions. Protection of health from environmental contaminants was buttressed by the proposed and final cancellation and suspension of a number of pesticide products. Funding for the cleanup of Federal facilities has continued to increase dramatically. Progress in water quality—with the exception of vigorous criminal and civil enforcement efforts—has been slowed by Federal court decisions concerning the Refuse Act of 1899 and even more so by the lack of urgently needed new water quality legislation. Federal park and recreation programs continued to be carried out at increased levels, and wildlife protection has received new emphasis. Federal agencies are preparing for a new thrust in environmental research.

This year there have been major steps in implementing the Clean Air Act and numerous other executive actions. At the same time, a wide range of new laws is nearer passage. Once these new laws are passed, the pace of implementation can be expected to quicken even more. This year and the next few years are critical to laying the framework for environmental improvement activities that will affect our physical surroundings for decades.

footnotes

1. P.L. 91–604, 91st Cong., 2d Sess. (December 31, 1970) as codified in 42 U.S.C. § 1857 *et seq.*; 49 U.S.C. §§ 1421, 1430.
2. 36 *Fed. Reg.* 8186 (1971).
3. 37 *Fed. Reg.* 10842 (1972).
4. See, *e.g.*, *Buckeye Power Inc.* v. *EPA* (6 Cir. No. 72–1628 filed June 23, 1972).
5. See, *e.g.*, *Natural Resources Defense Council* v. *EPA* (2 Cir. No. 72–1224 filed June 30, 1972).
6. *Sierra Club* v. *Ruckelshaus,* 4 ERC 1205, 2 ELR 20262 (D.D.C. 1972).
7. The Environment Reporter—Current Developments, B.N.A., Inc., Vol. 3, p. 59.
8. See, *e.g.*, *General Motors Corp.* v. *Ruckelshaus* (D.C. Cir. No. 72–1525 filed June 8, 1972).
9. 37 *Fed. Reg.* 3882 (1972).
10. 36 *Fed. Reg.* 19697 (1971).
11. 36 *Fed. Reg.* 16905 (1971).
12. 40 C.F.R. § 60 (1972).
13. *Essex Chemical Corp.* v. *EPA* (D.C. Cir. No. 72–1072 filed Jan. 21, 1972); *Portland Cement Assn.* v. *EPA* (D.C. Cir. No. 72–1073 filed Jan. 21, 1972); *Appalachian Power Co.* v. *EPA* (D.C. No. 72–1079, filed Jan. 24, 1972).
14. 42 U.S.C. §§ 4331, 4332(2)(C).
15. 36 *Fed. Reg.* 23239 (1971).
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25. Council on Environmental Quality, The President's 1972 Environmental Program, pp. 15–38.
26. *Id.*
27. 37 *Fed. Reg.* 12391 (1972).
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29. 36 *Fed. Reg.* 16215 (1971).
30. 36 *Fed. Reg.* 24960 (1971).
31. 33 U.S.C. § 407.
32. *U.S.* v. *Armco Steel Corp.*, 3 ERC 1067, 1 ELR 20517 (S.D. Tex. 1971), *modified,* 3 ERC 1263 (S.D. Tex. 1971).
33. The Environment Reporter—Current Developments, B.N.A., Inc., Vol. 2, p. 571; *U.S.* v. *Florida Power and Light Co.,* 1 ELR 20461 (S.D. Fla. 1971).
34. 3 ERC 1458, 1 ELR 20637 (D.D.C. 1971).
35. *Supra* note 14.
36. 36 *Fed. Reg.* 7723 (1971).

37. *U.S.* v. *Pennsylvania Industrial Chemical Corp.*, 4 ERC 1241 (3 Cir. 1972).
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39. 3 C.F.R., 1966–1970 Comp. 889.
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41. 7 U.S.C. § 135 *et seq.*
42. *In re Stevens Industries, Inc., et al.* (consolidated DDT hearings), I.F. & R. docket No. 63 *et seq.* (June 14, 1972).
43. *Coahoma Chemical Co., Inc., et al.,* v. *Ruckelshaus* (5 Cir. No. 72–2263 filed June 14, 1972).
44. *Environmental Defense Fund* v. *EPA* (D.C. Cir. No. 72–1548 filed June 14, 1972).
45. 37 *Fed. Reg.* 10987; 37 *Fed. Reg.* 13299 (1972).
46. *In re Shell Chemical Co.*, I.F. & R. docket No. 145 *et seq.* (June 26, 1972).
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66. Rev. Rul. 72–190; IRC § 103(c)(4)(E).
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76. H.R. 14669, 92nd Cong., 2d Sess. (1972).
77. *Id.*
78. *Id.*
79. *Id.*
80. S. 1684, H.R. 11066, 92nd Cong., 1st Sess. (1971).
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126. Council on Environmental Quality, 102 Monitor. Each month the 102 Monitor is reprinted in its entirety in the Congressional Record. Subscriptions to the 102 Monitor may be obtained by writing the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. The annual subscription rate is $6.50.
127. The 102 Monitor and the Saturday issue of the Federal Register contain order numbers for environmental impact statements available from NTIS and ELR.

5

the past year — continuing state progress

In the past year, States* have continued to allot more resources and to bring imaginative thought to environmental programs. While more manpower and funds were concentrated in such traditional areas of concern as air and water quality, many States also passed legislation in other environmental problem areas, among them: noise, solid waste, radiation, and pesticide control. And, as part of a quickening movement, more States have moved to enhance and protect environmental quality by legislating land use controls. The laws vary in comprehensiveness and method of control. Many cover specific geographic areas, such as wetlands and coastlines.

Two States, New Mexico and Pennsylvania, adopted constitutional amendments to guarantee protection of their environment. Pennsylvania's "Natural Resources and Public Estate Amendment" guarantees the people "the right to clean air, pure water and to the preservation of natural scenic, historic and aesthetic values of the environment." [1] In New Mexico, environmental quality was designated a fundamental right to be preserved by the legislature.[2] North Carolina's legislature voted to put an amendment to conserve and protect its natural resources on the 1972 ballot for voter approval.[3] These amendments are significant, not only because of their clear statement of constitutional authority to buttress State protection in the area of environmental quality, but also because they give individuals and groups standing in court and in administrative actions.

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*The term "State" includes the District of Columbia, Guam, Puerto Rico, the U.S. Virgin Islands, and American Samoa where appropriate.

As was the case in last year's report, limited space and data force this chapter to be a selective survey. Examples that are cited range from interesting and unique innovations to actions representing larger trends. To cite a particular example is not to endorse the program. Nor should failure to describe a program or accomplishment be viewed as a judgment that it is less important or significant than others. Some important activities have been omitted either because information was lacking or because they occurred too late to be covered adequately.

controlling pollution

Setting and enforcing standards was the main thrust of State activity during the past year. Appropriations for pollution control, while continuing to grow, in many cases could not keep up with needs. New areas of regulation and increased needs for planning, technical, and legal manpower to enforce standards and prosecute polluters continue to be major problems vexing State environmental activities.

broadened fiscal support

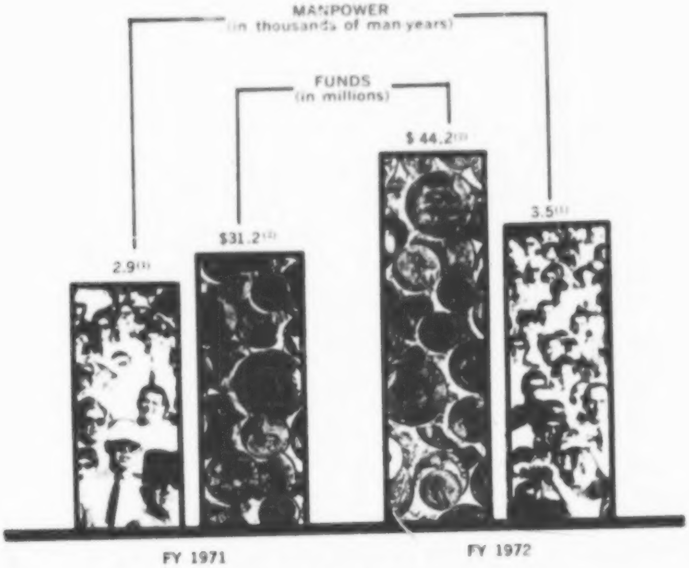
Most States continued to increase their direct appropriation of funds for pollution control programs. Some States also experimented with fee systems in air and water pollution control. Figures 1 and 2 outline the increases in the amount of money and manpower set aside by the States for pollution control programs in air and water quality—for setting and enforcing standards and for monitoring, planning, and training. Virginia and Pennsylvania are two examples. Virginia has more than tripled funding to support its air pollution control board staff for fiscal years 1972–74 over the previous 2 fiscal years 1970–72—from $320,000 to $1,026,000. By the end of the fiscal year ending June 30, Pennsylvania had 30 attorneys working full time in environmental law enforcement. This is 10 times the strength of the enforcement staff in August 1970.

Table 1 shows that the six New England and three Middle Atlantic States accounted for 58.9 percent of the 50 State governments' total spending for water quality in fiscal year 1969-70—even though only 24.1 percent of the population lived in those States. The eight Mountain States spent $1.6 million, less than any of the other geographic divisions. No Rocky Mountain State spent more than $260,000 on water quality control. In the Northeast region, by contrast, no State spent less than $530,000.[4]

Table 2 shows spending for air quality control by region. It shows that the three Middle Atlantic States and the five Pacific States led all others by far in average expenditures.

Figure 1

Funding and Manpower for State and Local Water Pollution Control Agencies



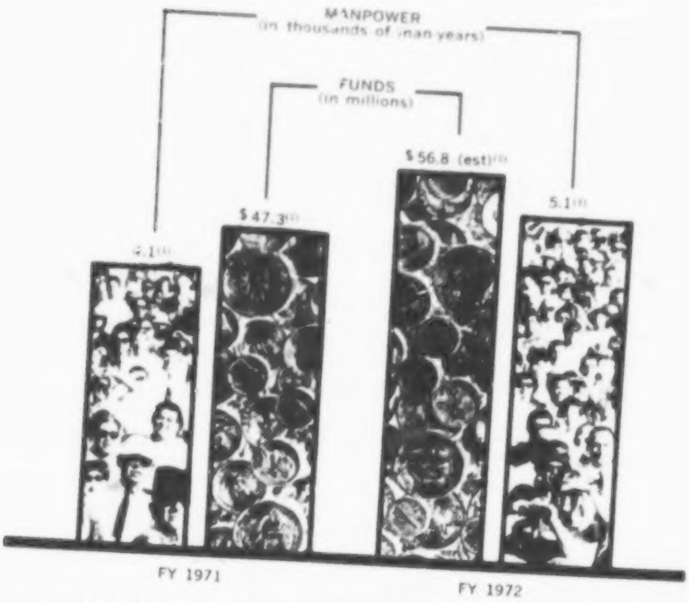
1 Total man-years supported by Federal, State and Local funds
2 State funds

Source: Environmental Protection Agency, 1972

Figure 1 does not include expenditures for building waste treatment facilities. In fiscal year 1971, States and communities contributed $2.17 billion in grants and loans to help pay for construction of municipal sewage treatment facilities. New York State has mounted a large-scale effort for this purpose over the past few years. The first phase of its pure waters program, started in 1968, is finished. Under this program, 352 sewage treatment projects have been built or are underway at a cost of slightly over $3 billion. A $1.2 billion bond issue has been adopted by the New York legislature to carry this work forward and to undertake other environmental programs.[5] The bond issue must be approved by the voters in the November election. Of the $1.2 billion, $650 million would be used to continue cleaning up the State's waters; $150 million is earmarked for public air pollution control facility grants; and $400 million is to preserve and enhance the State's land resources, manage solid waste, and provide fishing and other recreation opportunities.

Figure 2

Funding and Manpower for State and Local Air Pollution Control Agencies



[1] Total man-years supported by Federal, State and Local funds
[2] State and Local not including Federal Funds

Source: Environmental Protection Agency, 1972

Several other States passed or authorized bond issues for sewage treatment and other environmental facilities last year. Texas voters approved a $100 million bond issue for environmental purposes.[6] Vermont authorized $50 million in bonds over a 10-year period for the construction of municipal water pollution control facilities.[7] The Oregon legislature directed the State's Environmental Quality Commission to issue $100 million in bonds for pollution control.[8] In Minnesota, the legislature appropriated $10 million and authorized a $25 million bond issuance to provide grants to municipalities for construction of sewage disposal facilities.[9] In Missouri, the legislature passed a $20 million sewage treatment bond authorization, which voters must approve in the next election.[10]

Some States have developed new means to raise funds for pollution control. Wisconsin passed a law levying a fee to cover monitoring costs for both air and water pollution. Under the law, the State's Department of Natural Resources can require all persons (except

Table 1

State Government Expenditure for Water Quality Control, by Region and Geographic Division, Fiscal Year 1969–70

(Thousands of dollars)

Region and geographic division	Total expenditure	Average per State
Total (50 States)	**$157,088**	**$3,141**
Northeast (9 States)	92,557	10,284
New England (6 States)	30,760	5,127
Middle Atlantic (3 States)	61,797	20,599
North Central (12 States)	26,073	2,173
East North Central (5 States)	23,231	4,646
West North Central (7 States)	2,842	406
South (16 States)	19,880	1,243
South Atlantic (8 States)	11,767	1,471
East South Central (4 States)	1,759	440
West South Central (4 States)	6,354	1,589
West (13 States)	18,578	1,429
Mountain (8 States)	1,606	201
Pacific (5 States)	16,972	3,394

Source: U.S. Department of Commerce, Bureau of Census.

Table 2

State Government Expenditure for Air Quality Control, by Region and Geographic Division, Fiscal Year 1969–70

(Thousands of dollars)

Region and geographic division	Total expenditure	Average per State
Total (50 States)	**$22,767**	**$455**
Northeast (9 States)	6,343	705
New England (6 States)	1,175	196
Middle Atlantic (3 States)	5,168	1,723
North Central (12 States)	2,685	224
East North Central (5 States)	1,961	392
West North Central (7 States)	714	102
South (16 States)	6,538	409
South Atlantic (8 States)	4,309	539
East South Central (4 States)	1,218	305
West South Central (4 States)	1,011	253
West (13 States)	7,211	555
Mountain (8 States)	1,238	155
Pacific (5 States)	5,973	1,195

Source: U.S. Department of Commerce, Bureau of Census.

municipalities) discharging pollutants into the air or water to report the nature, method, and amount of the discharge. The law calls for an annual monitoring fee of up to $10,000, based on concentration and quantity of pollutants to finance State-sponsored monitoring. The fee is to be paid by each discharger together with a $50 administrative fee.[11] A similar law levying an air pollution monitoring fee passed the Senate in the legislature of Michigan, a State that already has a water quality monitoring fee.[12] It still requires approval of the House.

Rhode Island is asking for voter approval in November 1972 of a law enacted by the legislature to allow the Industrial Building Authority to finance antipollution equipment on existing industrial plants through a loan guarantee of up to 80 percent of the cost of the project.[13]

The Ohio legislature enacted a severance tax on minerals removed from Ohio. It will raise additional revenue for the State's environmental programs with at least one-half of the proceeds being used to reclaim abandoned strip-mined areas. The tax would range from 4 cents per ton of coal to 1 cent per 1,000 cubic feet of natural gas.[14]

stricter regulation

States have been experimenting with new laws to upgrade and tighten their regulatory activities. In the past, most regulatory procedures were cumbersome and time consuming. Penalties for violators of pollution laws were light. In many cases, it was easier for firms and municipalities to pollute and pay a small penalty than to spend money for pollution control technology. Many States are stiffening the penalties for pollution and streamlining their enforcement capabilities.

air quality—In accordance with the Federal Clean Air Act, EPA set air quality standards for six of the most prevalent air pollutants: particulate matter, sulfur oxides, carbon monoxide, hydrocarbons, nitrogen dioxide, and photochemical oxidants. States and other jurisdictions were required to submit by January 1972 implementation plans for meeting these standards or face the alternative of having EPA write and impose its own plan. On May 31, EPA fully approved 14 plans and partially approved 41 plans.[15]

Table 3 shows the status of State legal authority to carry out air implementation plans. Fifty-four States and territories now have authority to adopt emission standards, limitations, and other measures geared to satisfy the requirements of the Federal Clean Air Act of 1970. All 55 States and territories have authority to enforce applicable laws, regulations, and standards. Fifty-one States and territories have enacted authority to abate pollutant emissions on an emergency basis. Fifty-three States and territories have authority to prevent construction, modification or operation of stationary sources whose emissions prevent attaining or maintaining national standards.

Thirty-four States and territories have authority to require stationary sources to install emission monitoring devices and to report the results.

The law that Texas adopted is typical of legislation being enacted by States to require construction permits for facilities that may emit air pollutants. Under the new Texas law, which was passed in the fall of 1971, applicants for construction permits must submit to the Texas Air Control Commission copies of all specifications necessary for determining whether the new plant will comply with State air pollution control standards. If the permit to construct is granted, the person in charge of the plant must apply for an operating permit within 60 days after plant operations begin. Monitoring data may be required.[16]

Alabama enacted its Air Pollution Control Act of 1971 last September.[17] This law established an Air Pollution Control Commission with authority to adopt air quality, emission, and emergency episode standards. The Commission was also authorized to issue permits for new construction and for the modification or use of any equipment that may be a pollution source The law sets penalties of up to $10,000 a day for violations of the Act or Commission regulations.

Table 3

Legal Authority Necessary for Carrying Out State Air Quality Implementation Plans (as of May 26, 1972)

Legislative authority	States with authority	
	Approved	Disapproved [1]
1. Adopt emission standards, limitations and other measures to attain and maintain national standards.	54	1
2. Enforce applicable laws, regulations, and standards, and seek injunctive relief.	55	0
3. Abate pollutant emissions on an emergency basis.	51	4
4. Prevent construction, modification or operation of stationary sources whose emissions will prevent attaining or maintaining national standards.	53	2
5. Obtain information needed to determine air pollution source compliance.	51	4
6. Require stationary sources to install emission monitoring devices and report results to State which in turn shall make such information available to the public.	34	21
7. Inspection and testing of motor vehicles and/or application of transportation control measures and land use control measures.[2]	7	11 [3]

[1] Includes partial disapprovals.

[2] Authority that may be required in addition to that listed above for attaining and maintaining national standards. Includes District of Columbia, Guam, Puerto Rico, U.S. Virgin Islands, and American Samoa. In some cases, figures are approximations based on best available data.

[3] Have timetables for obtaining necessary legal authority.

Source: U.S. Environmental Protection Agency, Office of Air Programs.

The promising new Alabama law replaced a law with many deficiencies.

Under a new Tennessee law,[18] the Commissioner of Public Health is now able to initiate direct enforcement action, thus speeding the procedures. Prior to this law, it was necessary for the State Air Pollution Control Board to issue an enforcement order in each case before the Commissioner could take any action. In effect, the new law makes the Board an advisory and policy-setting organization rather than the primary instigator of enforcement action. In addition, the Air Pollution Control Division of the Tennessee Department of Public Health now has the authority to enforce specific local air pollution regulations if local authorities do not do so. Prior to passage of the new law, it would have been necessary for the State to take over the entire local program if there were any failure.[19]

In California, a so-called People's Lobby Initiative [20] appeared on the June ballot. The Initiative proposed revolutionary means for dealing not only with air pollution problems but also with powerplants, pesticides, and oil and gas exploration. The Initiative proposed stringent penalties for air polluters. In a section called "Incentive Levies," [21] any person found to violate any air pollution law in the Health and Safety Code would have had to pay, within 1 day, 0.4 percent of his prior year's gross income and an equal sum each day until an abatement program was undertaken. When the program was completed, the person would be refunded 75 percent of what he paid. In the June 6 election, the entire initiative was defeated by about a 2-to-1 margin.

Under the Federal Clean Air Act, authority to regulate emissions from new automobiles is reserved to the Federal Government—with a special exception for California.[22] To meet compelling and extraordinary conditions in that State, California is eligible for a waiver from EPA, permitting it to establish stiffer standards for new motor vehicles than Federal standards. All State governments retain authority to achieve ambient air quality by means other than emission limits on new vehicles. Thus, State activity in this area has been principally concerned with strengthening State inspection of emission control devices to insure proper operation. In addition, some States have begun to develop new plans to regulate the use of autos in order to meet air quality standards (see Table 4).

During 1971, at least five States took additional steps to tighten their regulations on automobile emissions. In California, legislation was enacted requiring the use of antismog devices on all 1966-70 cars and trucks. Under the law, the State's Air Resources Board was authorized to set standards that would significantly reduce nitrogen oxide emissions. Motor vehicles coming up for 1973 registration must have the devices installed.[23]

New Jersey enacted an amendment to its Air Pollution Contr Code [24] to require annual emission testing of automobiles. Cars that

Table 4

Transportation Controls Required or Being Considered by States To Improve Air Quality

State	Motor vehicle inspection	Motor vehicle retrofit	Fuel conversion	Improved public transportation	Others
Alaska					×
Arizona	×	×	×		
Arkansas	×				
California	×	×	×	×	×
Colorado	×	×		×	
Connecticut					
District of Columbia	×		×	×	
Florida				×	
Kentucky	×				
Louisiana	×	×			
Maryland	×			×	
Massachusetts	×		×	×	×
Minnesota				×	
Nebraska	×				
Nevada				×	
New Jersey	×				
New Mexico	×				
New York	×	×	×	×	×
North Carolina	×				
Ohio	×			×	
Oregon	×			×	
Pennsylvania	×				
Tennessee	×				
Texas				×	×
Utah	×			×	
Washington	×			×	
Wisconsin	×				

Source: U.S. Environmental Protection Agency.

fail the test—being given as part of the regular safety inspection beginning July 1, 1972—will not be allowed on the roads without corrective measures.

Louisiana enacted legislation to require, as part of its periodic inspection program for automobiles, an inspection of the automotive emission control devices required under Federal law for all models produced or sold after model year 1968 to assure that the devices are operative. The law also requires the Director of Public Safety to promulgate standards for installing approved emission control devices on new and used motor vehicles operating on Louisiana highways by 1976.[25]

Oregon legislation authorizes its Department of Environmental Quality to establish motor vehicle emission standards for existing vehicles and to certify emission control systems. The act also prescribes testing and licensing of persons to certify the devices.[26]

water quality—Table 5 shows the level of State activity in carrying out water quality programs. By April 1972, all but eight States had standards in effect which were fully approved under Federal law. All

50 States had some form of monitoring system in effect. And over 30 States had established a permit system to control water pollution by industry.

new regulatory controls—Considerable new State water quality legislation control was initiated in the past year. The State of Washington enacted legislation empowering the Director of its Department of Ecology to require the use of "all known available and reasonable methods of treatment" of waste water discharged into the State's waters—regardless of established water quality standards.[27] Washington is the only State to adopt such an approach by legislation.

Idaho and Georgia have amended their enforcement procedures for water pollution. In the new Idaho law, responsibility for pollution control was consolidated in a Department of Environmental and Health Protection. In emergencies when it is not feasible to follow the Department's normal administrative procedures, the Idaho Attorney General is empowered to take direct and immediate legal action against polluters.[28] Georgia amended its Water Quality Control Act to abolish the Georgia Water Quality Board and form a new Environmental Protection Division in the Department of Natural Resources with authority over water quality. The new Division was armed with greater enforcement authority. Included in the new amendments were civil penalties of up to $1,000 for each violation and up to $500 for each day that such a violation continues. The law also established civil liability for the costs of cleaning up oil and other toxic spills and for the costs of restoring damaged natural resources. The Environmental Protection Division is authorized to go to court directly against elected officials as individuals when they fail to carry out the provisions of the Act.[29] Finally, another amendment to the Act makes water quality data available without subpoena to private parties in private litigation.[30]

In Tennessee, the 27-year-old Stream Pollution Control Act was replaced by a new water quality law.[31] Under the old statute, polluters could only be prosecuted if they violated a special order of the Stream Pollution Control Board. Special orders could be issued only if pollution had already taken place. As many as eight administrative steps could be required before a discharger could be taken to court. Because of the time limits allowed for the various steps, as much as 2 years could go by before the Stream Pollution Control Board could obtain a court order. The State had taken only five pollution cases to court under the old statute and had won decisions in only two. The new law deals directly with this problem by making it unlawful to fail to apply for a discharge permit, to discharge wastes without a valid permit, or to violate either the terms of a permit or water quality standards. Firms violating the law may be fined as much as $5,000 per day. And any manager of such facilities who knowingly circumvents the law is liable not only for the fine but also for a 2-year prison term.

Table 5

State Water Quality Program Elements
April 1972

STATE	INTERSTATE (Federal Approved) WATER QUALITY STANDARDS		PERMIT SYSTEM		STATE CONSTRUCTION GRANTS	ROUTINE TREATMENT PLANT INSPECTION*	STATE MONITORING SYSTEM	BASIN PLANS TO BE DEVELOPED FY 1972
	FULLY	EXCEPTIONS	MUNICIPAL	INDUSTRIAL				
Alabama						1		–
Alaska								5
Arizona						2		21
Arkansas						2		–
California								–
Colorado						3		11
Connecticut						1		7
Delaware								3
D.C.								–
Florida						1		6
Georgia								20
Hawaii								3
Idaho						2		6
Illinois								7
Indiana								28
Iowa								15
Kansas								–
Kentucky						3		–
Louisiana						2		19
Maine						1		3
Maryland								6
Massachusetts						1		11
Michigan								25
Minnesota								10
Mississippi						1		4
Missouri								4
Montana								3
Nebraska						1		4
Nevada						4		–
New Hampshire						1		–
New Jersey								20
New Mexico						4		5
New York								7
North Carolina						1		49
North Dakota						1		15
Ohio								–
Oklahoma								–
Oregon								–
Pennsylvania								1
Rhode Island						1		–
South Carolina								–
South Dakota								17
Tennessee								–
Texas						1		9
Utah								3
Vermont						1		6
Virginia								30
Washington						1		8
West Virginia						4		–
Wisconsin								30
Wyoming								2
Guam								–
Puerto Rico						2		–
Virgin Islands								–

*1 Municipal & Industrial Only
2 Municipal Only
3 Municipal & State Only
4 Industrial Only

Source: Environmental Protection Agency, 1972

In Illinois, the Pollution Control Board adopted a comprehensive set of new water pollution regulations for the State, covering both water quality standards and water use designations. The regulations also cover effluent standards, monitoring and reporting, waste treatment performance criteria, sewage discharge criteria, waste disposal from watercraft, discharge permits, and implementation plans.[32]

Legislation increasing penalties for oil spills was enacted in New Jersey and Alaska. The New Jersey legislature passed a bill in May 1971 authorizing fines for oil spills in New Jersey waters. The new law holds offenders liable for up to $14 million in cleanup expenses.[33] In Alaska, the legislature set a maximum penalty of 1-year imprisonment and a $25,000 fine for oil discharges not approved by the Department of Environmental Conservation.[34]

Florida's Oil Spill Prevention and Pollution Control Act [35] was held to be invalid by a Federal district court.[36] The court held that the law conflicts with Federal maritime law, which preempts State and local law. Florida's law imposes unlimited liability without fault on virtually all vessels discharging oil or other pollutants in the State's territorial waters while going to or from Florida ports. Terminal facilities are subject to the same liability. The Supreme Court will hear an appeal by the State of Florida on the ruling.

Maine's oil discharge prevention and pollution control law, which is similar to Florida's, is also being tested in court. It also places a fee on all transfer of oil along the Maine coast. The fees collected are to be used to establish and maintain an oil spill clean-up fund.[37]

States are increasingly using discharge permits and discharge disclosures as an administrative device to force compliance with standards. Maine, for example, authorized the State Environmental Improvement Commission to issue licenses to industries and municipalities that discharge wastes into any State waters.[38] In Washington, the Pollution Disclosure Act of 1971 requires those who are dumping pollutants into the air or water of the State to submit a record of those discharges to the Department of Ecology.[39]

The Oklahoma Water Resources Board adopted a new program in 1971 requiring that major industries periodically submit detailed chemical analyses of wastes being discharged into waterways. To provide equivalent methods of analysis and uniformly accurate results, the State now requires that all commercial and industrial laboratories be certified by the Oklahoma Water Resources Board.

In April 1972, the New Jersey legislature approved a bill empowering the State to make industries pretreat their wastes before emptying them into public sewer systems.[40] In Nevada [41] and Alabama [42] new laws require industries to obtain discharge permits and report waste discharges.

Vermont enacted a law in 1969 levying an effluent fee on industrial and municipal dischargers not in compliance with State water quality standards.[43] The latest amendment to that law was passed in the 1972 legislative session. It eliminates the effluent charge for those industries and municipalities that are adhering to pollution abatement schedules established in temporary discharge permits issued to them by the State.[44] As explained in last year's report, these temporary permits are given to dischargers who are not in compliance with water quality standards but are working toward them. Under the original law, only holders of "discharge permits," who are in compliance with standards, were exempt from the fee.

Minnesota, Indiana, and New Hampshire also took steps to control pollution of their rivers and lakes. Minnesota imposed controls on wastes dumped from boats. The Minnesota legislation requires watercraft to provide retention facilities in lieu of treatment devices and authorized the Pollution Control Agency to speed up the rate at which devices must be installed for particular waters.[45] Indiana levied an 8-cent tax on marine gasoline and will use the income for antipollution purposes.[46] New Hampshire enacted legislation in June 1971, making persons who unlawfully discharge contaminants into State waters liable to the State for any damage to fish or other aquatic life or wildlife and their habitat.[47]

A number of States have recognized the pollution problems caused by feedlot operations and are taking steps to control and regulate them. Sixteen States now either have specific laws and comprehensive regulations on feedlots or are in the process of developing them. During the past year, Minnesota adopted regulations and standards governing the storage, collection, transportation, and disposal of wastes from feedlots. The regulations require permits for the construction and operation of feedlot waste disposal systems.[48] New Indiana legislation authorized the State's Stream Pollution Control Board to regulate feedlots.[49] South Dakota adopted new regulations spelling out procedures for securing a permit to discharge waste from a feedlot. It also passed regulations for operating water pollution control facilities for livestock enterprises.[50]

greater state involvement—In 1969, Ohio created the Ohio Water Development Authority (OWDA) to help provide sewage treatment systems to municipalities and industries. This year Ohio empowered OWDA to take over and improve any sewage systems that fail to meet the standards set by the Water Pollution Control Board.[51] In addition, Ohio's Department of Natural Resources has been combating water pollution by wielding its enforcement authority under the 3-year-old Stream Litter Law.[52]

Some States are attempting to develop area or watershed protection programs. For example, California is working jointly with Nevada on a comprehensive watershed protection program in the Lake Tahoe area. An advanced waste treatment plant installed on the California side of the border provides 98 percent treatment before the effluent is pumped to a storage reservoir outside the Lake Tahoe drainage basin. In Virginia, the State Water Control Board is developing plans for a project described as "Tahoe East" at the Occoquan Reservoir.

The board made a major break with the past by adopting a policy of treating the sewage effluent to very high levels to permit its retention in the watershed and to insure safe use for the water supply. The plan calls for using the technology developed at the advanced South Lake Tahoe Treatment Facility.

New Hampshire also enacted legislation establishing basin-wide pollution control facilities in the Winnipesaukee River Basin. The facilities will be planned, constructed, and operated by the New Hampshire Water Supply and Pollution Control Commission if the affected municipalities concur. This is a further example of the more direct State involvement in sewage treatment noted in last year's report, which discussed ongoing programs in Maryland, New York, and Ohio.[53]

Basin plans, required by EPA regulations as a precondition to receiving waste treatment construction grants,[54] are becoming a major tool for State involvement in comprehensive water quality planning and implementation. The basin-wide approach permits more effective control of pollution at lower costs than if individual communities worked independently on the problem.

sediment and erosion control—Sediment resulting from soil erosion is the Nation's major water pollutant by volume and often carries other harmful pollutants such as nutrients and pesticides. Farm and forest lands needing erosion control are still the primary sediment sources, but other sediment sources—such as residential, industrial, commercial, and institutional construction in urbanizing areas, highway and roadbuilding, and surface mining—present growing problems.

Major responsibility for the prevention of soil erosion has been vested in soil conservation districts in each of the 50 States, Puerto Rico, and the Virgin Islands. There are now 3,027 of these districts, with boundaries mainly following county lines. They include over 98 percent of the privately owned land in the Nation. In each State, the districts are supervised by a State agency, usually a soil and water conservation commission.[55] The districts provide services to landowners in evaluating their conservation problems, determining land capabilities, and installing structural and vegetative measures and management systems designed to meet conservation requirements.

The prevention of erosion and the control of sediment have been prime objectives of conservation districts since their inception. Conservation plans developed for rural landowners give first priority to erosion control. Also, in some areas where highways, commercial developments, and urban housing are being concentrated, creating major sediment problems, districts have developed land use, erosion prevention, and sediment control programs with States, counties, towns, and cities.

Most district work has been carried on with landowners on a voluntary basis. There is a growing recognition, however, that some form of regulatory authority is needed to control sediment. In 27 States[56] and Puerto Rico, districts are authorized to issue land use regulations for controlling soil erosion. Because most of these State laws require a hearing and referendum before any such regulation may be enacted by the district, the provisions have not been used to any great extent in the past. Only two soil conservation districts have land use regulations currently in effect, one in North Dakota and the other in Oregon.[57]

Some States have enacted new legislation to strengthen State programs for the control of erosion and sediment. Iowa, in 1971, enacted a law which requires the State's conservation districts to adopt regulations to establish soil loss limits and provide for their implementation. Districts are authorized to require landowners to employ sediment control practices. However, no landowner may be required to establish any new practices unless Federal or other public cost-sharing funds have been approved and made available to the landowner in an amount equal to 75 percent of the cost.[58]

Ohio amended its Soil and Water Conservation District Law in January 1972 to authorize the Director of Natural Resources to develop a procedure for coordinating agricultural pollution abatement and urban sediment control programs on the basis of standards for air and water quality set by the Ohio Air Pollution Control Board and the Ohio Water Pollution Control Board.[59]

The Virgin Islands enacted legislation in March 1971 which requires the Virgin Islands Soil and Water Conservation District to prepare and adopt regulations designed to prevent improper development of land and other harmful environmental changes, including comprehensive erosion and sediment control measures. Such measures are applicable to both public and private developments, including the construction and maintenance of streets and roads. Before land is cleared, graded, filled, or otherwise disturbed, earth change plans must be submitted for approval as conforming to the Islands' environmental protection plan.[60]

The pioneering State program for controlling nonagricultural sediment was the 1970 Maryland law which established the first comprehensive Statewide regulatory system.[61] Other States, such as Virginia, are considering similar legislation.

phosphates—Some cities and States have continued to enact legislation to curb the level of phosphates in detergents. Eight States now have legislation regulating or affecting phosphates: Florida, Indiana, Maine, Michigan, Minnesota, New York, Connecticut, and Oregon.

The New York law provides that no household cleansing product can be distributed or sold if it contains phosphorus in excess of 8.7 percent by weight. And after June 1, 1973, phosphorus will be banned from New York cleansing products. The State also provided for labeling and for control of other substances in cleansing products which might prove environmentally harmful. Another important aspect of this bill is that the authority of local governments to regulate in this area is totally preempted by the State.[62]

The Connecticut law also bans the sale of detergents with more than 8.7 percent phosphorus by weight. The law also requires that phosphate content be labeled. After June 30, 1973, all phosphates will be banned with the exception of detergents manufactured for use in machine dishwashers, beverage and food processing, and industrial cleaning equipment.[63]

Maine,[64] Michigan,[65] and Florida [66] all have newly enacted laws covering phosphates and other harmful materials in detergents. The laws of Maine and Michigan set limitations similar to those of New York and Connecticut. The Florida law bans the sale after December 31, 1972, of those detergents "which are reasonably found to have a harmful or deleterious effect on human health or the environment."

The Indiana legislature set January 1, 1973, as the effective date for banning the sale of phosphate detergents. The deadline is extended to April 30, 1973, for detergents that will enter waste waters from commercial cleaning establishments or other waste waters that do not enter public sewers or streams.[67]

Oregon's law [68] requires labels on all cleaning agents sold in the State to show the phosphate content by weight, including grams per recommended use level. Phosphate control legislation is pending or being carried over from previous legislative sessions in eight other State legislatures: Alaska, Hawaii, Illinois, Iowa, Kansas, Maryland, Massachusetts, and Missouri. The legislatures of Arkansas [69] and Montana [70] passed resolutions requesting the Congress to investigate the problems of phosphate control.

On September 15, 1971, Federal agencies indicated that a number of phosphate substitutes for detergents were hazardous to health. They also announced a program to identify bodies of water eutrophied by phosphates and indicated that EPA will work with States and municipalities to upgrade sewage treatment facilities on such waters to remove phosphates. They suggested that State and local governments reconsider policies that might unduly restrict the use of phosphates in laundry detergents in view of health considerations.

ocean dumping—Rhode Island enacted a bill requiring anyone intending to dump or transport waste or dredged materials within the territorial waters of Rhode Island to obtain a permit from the State Director of Natural Resources. Under the law, restricted materials include silt, mud, shale, rock, muck, sand, garbage, or sewage. Applications for permits and public hearings are required. After a permit has been issued, a State inspector must be aboard the tow vessel at all times during the transporting and dumping operation.[71]

New Jersey adopted the Clean Oceans Act of 1971[72] and began preparing regulations to control the dumping of sewage, industrial wastes, and other pollutants into the sea. It is estimated that 88 percent of all East Coast ocean dumping from New Jersey of sewage sludge occurs within a few miles off the New Jersey Coast.[73] Of that total about 30 percent of the sludge originates in New Jersey itself.

Under this Act, the New Jersey Department of Environmental Protection has designed dual purpose regulations. The first purpose is to gather data on the scope, size, and methods of existing ocean dumping off the New Jersey coast. The second purpose is to impose an outright ban on ocean disposal of dangerous wastes, especially those for which adequate land-based disposal or treatment techniques already exist. Regulations to cover all dumping will be developed by the Department of Environmental Protection.

solid waste—Thirty-two States now have solid waste control laws, with 25 States requiring solid waste disposal permits (see Table 6). In many cases, however, implementation is left largely to local authorities. And as can be seen in Table 7, a number of States have completed statewide solid waste disposal plans.

Florida is the first State in the Southeast to adopt a long-range solid waste disposal plan. The program begins with a plan to eliminate 150 open trash dumps by July 1972. Projections for 1990 show a solid waste collection in the State of 22 million tons of trash, compared with 7.5 million tons now.

The New Jersey Board of Public Utility Commissioners issued regulations in July 1971 for solid waste collection and disposal. New Jersey, the only State in which the refuse industry has been designated as a public utility, will require that anyone engaged in solid waste collection or disposal obtain a certificate of public convenience and necessity. Rules have been established to govern licensing and operations.

Oregon enacted legislation during the 1971 session that consolidates statewide solid waste management responsibilities in the Department of Environmental Quality.[74] It provides for a permit system for establishing and operating solid waste disposal sites. The law also provides eminent domain to acquire sites.

Michigan's Solid Waste Management Act went into effect in early 1972. The law covers planning and operation of refuse management systems, licensing and regulation of garbage and refuse disposal operations, and regulation of collection centers for junked vehicles. Under the law, every city, village, or township with a population of at least 10,000 and every county must submit a solid waste management plan to the Director of Health for review and approval before July 1, 1973.[75]

Nevada is also adopting the statewide approach to solid waste management. During the 1971 session its legislature passed a bill ordering the Health Division to establish such a system.[76]

Table 6

Status of State Solid Waste Regulation

	Solid waste laws	Rules and regulations	Disposal permit required	Political subdivisions	
				Technical assistance	Financial assistance
Alabama	×	×			
Alaska					
Arizona	×	×			
Arkansas	×				
California					
Colorado	×	×	×	×	
Connecticut	×	×	×	×	×
Delaware		×	×	×	
District of Columbia		×			
Florida		×			
Georgia		×			
Hawaii	×				
Idaho		×			
Illinois	×	×	×	×	
Indiana	×				
Iowa	×	×	×		
Kansas	×	×	×	×	×
Kentucky	×	×	×	×	
Louisiana		×			
Maine				×	
Maryland	×	×	×	×	×
Massachusetts	×	×	×	×	×
Michigan	×	×	×		
Minnesota	×	×	×	×	
Mississippi		×			
Missouri		×			
Montana	×	×	×	×	
Nebraska					
Nevada	×				
New Hampshire	×	×	×	×	
New Jersey	×	×	×	×	
New Mexico		×	×		
New York	×	×		×	×
North Carolina	×	×			
North Dakota		×		×	
Ohio	×	×	×		
Oklahoma	×	×			
Oregon	×	×	×	×	
Pennsylvania	×	×	×	×	×
Rhode Island	×	×		×	×
South Carolina		×	×		
South Dakota	×	×		×	
Tennessee	×	×	×		
Texas	×	×	×	×	×
Utah		×		×	
Vermont		×	×	×	×
Virginia		×	×	×	×
Washington	×	×	×	×	×
West Virginia		×		×	
Wisconsin	×	×	×	×	
Wyoming	×			×	
American Samoa					
Guam					
Puerto Rico					
Trust Territory					
Virgin Islands					

Source: U.S. Environmental Protection Agency.

South Carolina's Pollution Control Authority recommended in its official State plan that solid waste be managed on a county-wide basis. The Pollution Control Authority also recommended using sanitary landfills. The authority counted only 5 that are operating satisfactorily throughout the whole State and said 18 were required.

Illinois and Vermont joined Oregon in legislating to control the problem of throwaway beverage containers. Under the Oregon law,[77] a 5-cent refund value is set on all containers for beer and soft drinks sold in the State. To promote use of beverage containers of uniform design, a 2-cent refund value is established if the container is interchangeable. The Oregon law also banned all cans with pull tabs and detachable lids. The new regulations proposed by the Illinois Polllution Control Board on November 15, 1971, would require all soft drink and malt beverage containers to be redeemable by the consumer for a minimum of 5 cents at the retail level. The proposal was based on the recommendation of the Illinois Solid Waste Management Task Force. At the time of this report, the proposed rules are being challenged in court. The law passed by Vermont bans all nonreturnable beverage containers by 1973.[78] Several years ago, Vermont abandoned a law banning nonreturnable beer bottles because the advent of beer cans made it ineffective.

noise—Continuing last year's trend, State legislatures have been active in considering, proposing and passing antinoise legislation. Comprehensive legislation was enacted in New Jersey in January. Under that law, the Department of Environmental Protection can regulate noise that is harmful to physical health or enjoyment of life. A 13-member council was also established by the Act to review any regulation that the department proposes. Fines of up to $3,000 would be levied for each violation.[79]

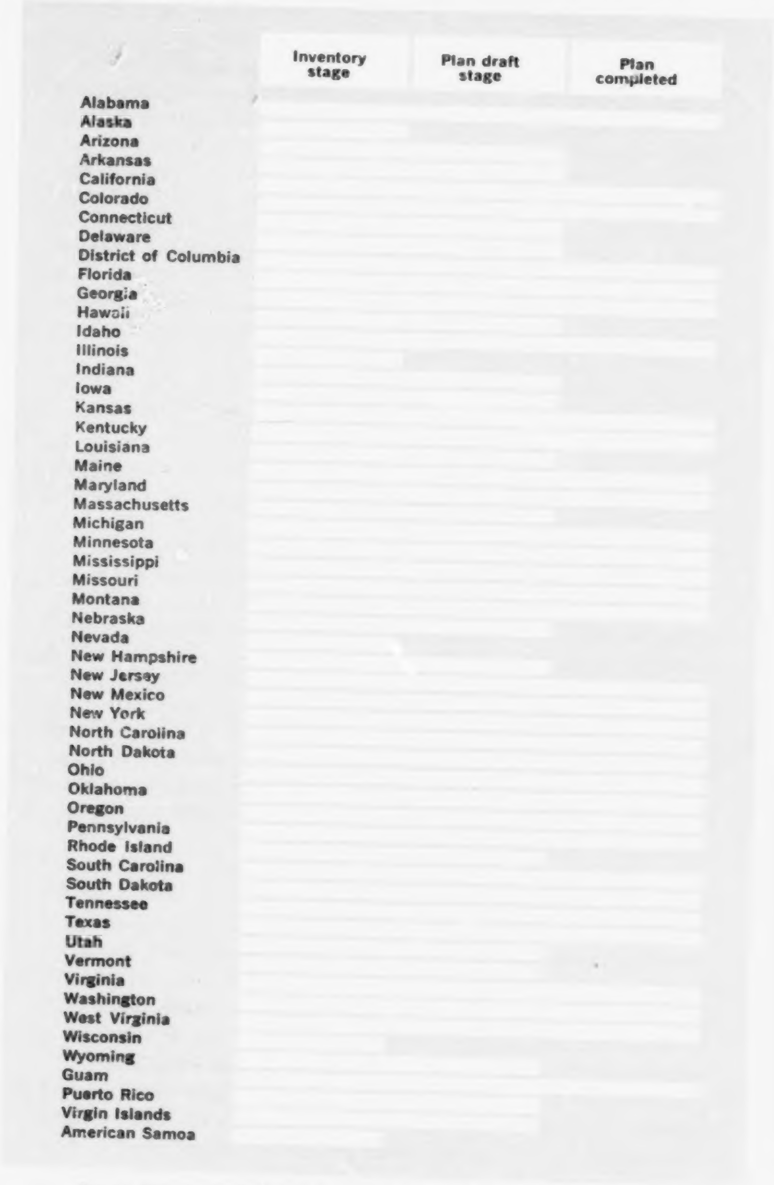
The North Dakota legislature vested antinoise authority in the State Department of Health. The department was charged with developing rules, regulations, and standards for the control of all types of industrial, agricultural, and community noises. The standards aim to minimize hazards to health and safety caused by excessive noise. The law covers noise from such diverse sources as farm machinery and rock bands but excludes aircraft.[80]

On December 6, 1971, Illinois enacted antinoise legislation that authorizes the State's Pollution Control Board to work with the Illinois Institute of Environmental Quality to establish categories of noise emissions and to study the technological and economic feasibility of noise level limits. It specifies that both people and property should be protected from excessive noise pollution.[81] Colorado has also adopted legislation on noise. Its new law limits noise levels for various sources, time periods, and locations.[82]

Massachusetts enacted a law regulating the operation of snowmobiles. The new law sets up a two-step schedule for noise controls. Prior to July 1, 1972, snowmobiles producing a sound level of more

Table 7

Progress in State Solid Waste Management Plans, June 1, 1972



Source: Environmental Protection Agency, Office of Solid Waste Management Programs than 82 decibels were outlawed. After July 1, 1974, the ceiling is reduced to 73 decibels.[83]

Michigan enacted new legislation giving the State authority to establish rules for operating snowmobiles and to set noise standards. The law also authorizes the State to tighten registration procedures and to provide for the protection of life, private property, and natural resources.[84]

Vermont also enacted legislation restricting off-road recreational vehicles on public land to areas designated by the Secretary of Environmental Conservation.[85] Vermont's new law also provides that snowmobilers must have permission to enter private property. Noise levels must be reduced to 82 decibels this year and thereafter to such levels as the Secretary may specify.

radiation—A number of States have moved to regulate radioactivity in the environment. Three States—Minnesota, Maryland, and Oregon—have issued water use permits, containing limitations on radioactive effluents, to utilities constructing nuclear reactors.

The legal uncertainty reported in last year's Annual Report concerning the authority of the States to regulate radioactive emissions from nuclear powerplants was removed on April 3, 1972, when the Supreme Court handed down its decision in *Northern State Power Company* v. *Minnesota*.[86] The Court upheld the decision of the U.S. Court of Appeals that a State is without authority to impose radiation protection standards on activities licensed by the U.S. Atomic Energy Commission. The State had attempted to set more rigid limits on a nuclear powerplant's radioactive discharges. Briefs had been filed in support of Minnesota by the States of Maryland, Michigan, New Mexico, Vermont, and Wisconsin.

Three States—New Jersey, Ohio, and Michigan—initiated special studies of nuclear power within their borders. In October 1971, the Governor of New Jersey appointed an interdepartmental nuclear energy council to coordinate that State's policy on the peaceful uses of nuclear power. The council was directed to make thorough and comprehensive studies of proposed nuclear powerplant locations and to analyze their environmental impact. The directive specified that the possibility of thermal pollution and excess radiation discharges must be considered.

The Ohio Department of Natural Resources ordered an assessment of the impact of that State's first two nuclear powerplants. The 7-month study, which will be paid for by the utilities, will consider the impact of thermal and other discharges as well as the social impact of the Davis-Besse and William Zimmer nuclear plants. The study will also probe the effects of the plants on aesthetic values, on nearby recreational activities, and on other aspects of the environment. According to the State, if the study shows that the present design of a plant's systems or procedures pose an environmental or social problem, alternatives will be reviewed.

Michigan will study the environmental effects of the Palisades nuclear plant site on Lake Michigan. The study's principal aim is to generate additional practical knowledge of the effect of the discharges from cooling towers on adjacent human activity. Specifically, the Michigan study will investigate the ways that cooling tower operations affect highway conditions, human environment, atmospheric changes, and agriculture.

pesticides—Several States enacted pesticide legislation during 1971. Most of the legislation either authorized a State agency to issue regulations on pesticide use or established lists of acceptable compounds.

Montana passed a Comprehensive Pesticides Act in 1971 to control the distribution, sale, application, disposal, and transportation of pesticides and related devices. The new law also calls for the registration of pesticides and licensing of applicators and establishes procedures for appeal and penalties for violators. A temporary advisory committee was also established.[87]

In March 1971, New Hampshire enacted legislation empowering the Pesticide Control Board to prohibit or restrict the sale and use of pesticides that the Board finds harmful to man or other nontarget organisms.[88] A Michigan law that became effective on January 1, 1972, directs the State Department of Agriculture to issue a list of pesticides that are potentially harmful to humans. Retailers and wholesalers must obtain licenses to sell such pesticides and must report all sales of such pesticides. Persons seeking an applicator's license will be required to show that they understand the acceptable uses and potential dangers of the product.[89]

The New Jersey legislature enacted a pesticide bill in June 1971. It authorizes the Department of Environmental Protection to establish regulations governing the sale, use, and application of pesticides in that State. The Department is authorized to file an injunction against anyone violating the regulations and to impose penalties up to $3,000 for each day of violation.[90]

The North Carolina legislature enacted a comprehensive Pesticide Control Act in July 1971. The law is designed to regulate the use, application, disposal, and registration of pesticides. A Pesticide Control Board was also established and charged with developing a list of restricted-use pesticides. The Board is also to write regulations on registering such pesticides and to develop a permit system for applicators.[91]

In California, two new pesticide laws were passed in 1971. One requires the licensing of pesticide advisers and establishes permits for pesticides. The other new law prohibits the use of misleading advertising and bars the handling of pesticides and containers except in compliance with regulations issued by the California Department of Agriculture.[92]

Georgia launched a pesticide usage profile to determine the type, quantity, and location of pesticides used in the State. The profile will also be used to pinpoint specific environmental hazards associated with the formulation, transportation, use, and disposal of pesticides and their containers. A Pesticide Usage and Application Act passed the 1972 Georgia General Assembly. The Act gives the Georgia Department of Agriculture regulatory responsibility, but requires the Commisioner of Agriculture to consult with the Director of the Division of Environmental Protection prior to setting standards for storing or disposing of pesticides and pesticides containers.[93]

Several other States passed pesticide laws. Among them were Delaware,[94] Alabama,[95] Indiana,[96] Texas,[97] and Utah.[98] Texas empowered its Structural Pest Control Board to establish standards and to issue regulations and licenses. Utah gave similar responsibility to its Commissioner of Agriculture.

The Connecticut Department of Environmental Protection issued new regulations in December 1971 to control insecticide use against defoliating insects such as the gypsy moth. The regulations require permits for aerial spraying for agricultural purposes. And they urge treatment of defoliating insects from the ground in areas of intensive human use. The regulations also contain an outright ban on the use of broad spectrum pesticides for nonagricultural purposes.[99]

In May of 1971, the California Department of Agriculture issued an emergency regulation setting mandatory intervals between the time certain crops are treated with pesticides and the time when workers can reenter fields where "substantial contact" with the treated crop will occur. The regulation requires the labels on pesticide containers to list the appropriate timetable laid down in the regulation. Until products have been labeled, manufacturers must supply dealers with supplementary printed directions.

Proposition 9, sponsored by the People's Lobby and voted on in the June California elections, would have prohibited the use of most persistent pesticides. No person could use, manufacture, or even possess them except under a permit from the State Director of Agriculture. The Director would need authorization of three-fifths of the members of each House of the legislature in order to issue the permit. This initiative was not enacted into law.

national symposium—A National Symposium on State Environmental Legislation was held in Arlington, Va., on March 15–18, 1972. It was sponsored by the Council of State Governments, the Council on Environmental Quality, the Environmental Protection Agency, and the Department of the Interior. The symposium brought together for the first time all elements of State government and representatives of Federal agencies to develop State legislation covering a broad range of environmental problems. Suggested legislation prepared by the workshops will be submitted to the Council of State Governments for inclusion in the Council's annual recommendations to the States.

organizing for action

Last year's report dealt in some detail with the way that several States reorganized programs to deal with their greatly enlarged responsibilities in the environmental area. The theme of last year's organizational effort by the States was centralized direction and control. That same theme continues throughout the period of this year's report. More States are also beginning to follow the Federal Government in analyzing the impact on the environment of their programs and activities.

On May 26, 1971, Nebraska enacted an Environmental Protection Act, creating a new Environmental Control Council and a Department of Environmental Control. The Council has authority and responsibility to adopt standards and regulations and to issue and revoke permits. The Department has administrative and enforcement responsibility for water and air pollution control and land use.[100]

On July 1, 1971, New Mexico established an Environmental Improvement Agency under the 1971 New Mexico Environmental Improvement Act.[101] The Act empowers the agency to administer all environmental and consumer protection programs in the State. A five-member Environmental Improvement Board appointed by the Governor is responsible for promulgating standards and regulations for food protection, product safety, water supply, liquid and solid waste disposal, air quality management, radiation, noise and vector control, environmental injury protection, toxic environmental chemicals, and occupational health and safety. The agency has five operating sections—consumer protection, general sanitation, water quality, occupational health, and radiation protection and air quality—as well as an environmental laboratory.

Connecticut created, in October of 1971, a Department of Environmental Protection, which consolidated most of the State's antipollution programs. The new Department replaces 16 independent agencies, boards, and commissions.[102]

Arkansas in its 1971 legislative session created a Department of Pollution Control and Ecology as one of the major departments of the State government. One of its functions is to make loans for financing waste water treatment plants. The Act also empowered the Department to issue revenue bonds in amounts to be authorized by the legislature, to issue permits, to collect fees, and to approve reclamation plans for strip mining.[103]

Alaska in 1971 created a Department of Environmental Conservation that is charged with overall coordination and planning related to the environment of the State. It will promulgate and enforce regulations and standards for all sources of air pollution and both surface and subsurface water pollution and for land use. The Department has five divisions: marine and coastal zone management; terrestrial ecology and environmental management; water and air quality control; land use and urban development; and permafrost and soils engineering.[104]

The Louisiana legislature voted to continue its Joint Committee on Environmental Quality.[105] All legislation relating to control of the environment is referred to it, and all action is deferred until the committee completes a full report. One of the major subjects to be considered by the committee is the problem of industrial waste disposal.

At least seven States—Montana,[106] Washington,[107] Delaware,[108] New Mexico,[109] North Carolina,[110] Wisconsin,[111] and Indiana [112] have enacted legislation in 1971 and 1972 requiring some form of environmental impact statement at the State level, similar to the 102 statements required at the Federal level by the National Environmental Policy Act (NEPA). Arizona and Hawaii have adopted similar requirements through administrative procedures and executive orders. Together with California, which in 1970 became the first State to enact such legislation,[113] at least 10 States and the Commonwealth of Puerto Rico [114] now have some form of impact statement requirement for State actions affecting the environment.

Although many of these State provisions parallel the provisions of the National Environmental Policy Act, some differences in approach are evident—in both the scope and the administrative means of implementing the requirement.

Montana's Environmental Policy Act (MEPA) took effect on March 9, 1971. The 13-member Environmental Quality Council established by the law includes representatives of the legislature, the public, and the Governor's office. Interim guidelines on the preparation of environmental impact statements were issued in October 1971, and by March 1972, 53 environmental impact statements or negative declarations had been filed with the Council. The Council also reviews and comments on Federal environmental impact statements. Although MEPA closely follows NEPA in many respects, the State's Environmental Quality Council is an arm of the legislature rather than the executive branch. As such it can maintain an oversight role over executive agencies. The Council acts as an ombudsman for the public and has statutory powers enabling it to investigate, on its own initiative or on request of the public or members of the legislature, agency compliance with MEPA or other environmental protection laws. The Council's investigative powers include performing audits, convening formal hearings, and issuing subpoenas.

In Wisconsin, a newly established Bureau of Environmental Impact is responsible for investigation and evaluation of the total impact of both public and private projects on the environment. Arizona's Game and Fish Department is required to complete an environmental impact statement prior to the start of construction on all large-scale water development projects. The statements follow the guidelines of the President's Council on Environmental Quality.[115] In Hawaii, 46 statements covering projects built on State lands or with State funds have been filed with the State's Office of Environmental Quality Control. The Indiana law and the North Carolina law both require environmental impact statements to be filed with the Governor. They include the same basic information required by section 102 of the National Environmental Policy Act.

innovative programs

Many States, instead of waiting for environmental problems to occur, are taking action to anticipate and avoid them. New tecnology, comprehensive land use planning, powerplant siting, reservation of natural areas for park lands, and preservation of wildlife are examples of the direction in which States are moving.

new technology

In New York, the Department of Environmental Conservation moved from the laboratory to the pilot plant phase in testing the physical-chemical sewage treatment process. The process uses chemicals, rather than bacterial action, to treat sewage. The process is expected to reach high tertiary levels of treatment at less cost than a combination of conventional and third-stage plants. The Department also took a step toward turning a pollutant into a beneficial resource. The Department's Office of Recovery, Recycling, and Reuse is studying ways to use waste heat from the Niagara-Mohawk Powerplant at Glenmont for climate control. To achieve a cooling effect, heated water from the plant is fed through pipes in the soil, run through dry heat exchangers, and then sprayed into the air inside a structure located near the powerplant. The direct use of heated water is under study in several agriculture and marine fish farming projects.

In June 1971, Pennsylvania entered into a contract with the General Electric Co. to establish a 17-station automatic telemetered air monitoring system. This system, which will cost $2.5 million, will let the State obtain "real time" information on air quality to permit immediate action in cases of air pollution "episodes." The remote air sampling stations will measure atmospheric concentrations of particulate matter, sulfur oxides, hydrogen sulfide, oxides of nitrogen, carbon monoxide and other contaminants. The first stations were to be installed in June 1972.

Ohio announced a plan to use proceeds from its proposed severance tax on minerals [116] to demonstrate a method to control mine drainage. Piles of acid-producing mine refuse are to be removed and burned in suitably prepared sites in accordance with air pollution regulations. Refuse piles that are not producing acid will be reshaped to prior land contours and reclaimed by seeding. A principal part of the project will involve sealing about 100 openings to underground mines that are now sources of acid discharge.

land use regulation

The Quiet Revolution in Land Use Control,[117] a study prepared for the Council on Environmental Quality, analyzed the land use laws of several States. Last year's chapter on State activities included several examples from that study. This chapter discusses some additional examples of State activity in land use control.

A recent survey of the States,[118] conducted for the Council of State Governments, reported that the States "appear to be in the process of embarking on a 'movement' toward assuring a greater responsibility for land resource management than had heretofore been the case."[119] Of the 38 responses to the survey, all but 3 recorded a high degree of interest in problems of land management. The survey indicated that three basic concerns underlie the interest of State governments in this area. The States are concerned about possible limits on future recreation opportunities; the rapid, uncoordinated, and piecemeal industrial, commercial, and residential development going on within their boundaries; and the lack of unified criteria by which to evaluate developments proposed in environmentally critical areas.

comprehensive controls—In April, Florida enacted its comprehensive Environmental Land and Water Management Act of 1972.[120] It provides a mechanism by which the State government can control key development decisions that affect the future of Florida. The Act closely follows the principles laid out in the President's proposed National Land Use Policy Act now pending before the Congress.[121]

Under the Florida legislation, the Division of Planning is directed to designate—subject to the approval of the Governor and his cabinet—"areas of critical State concern." The agency exercises considerable discretion in designating these areas, which are broadly defined in the statute. But the total of the areas designated at any given time cannot exceed 5 percent of the total area of the State. This limitation has been justified as helping to insure that the agency concentrates its efforts on the truly critical areas in the early operation of the Act. It also was designed to assure that the designations would not be used as a blanket "stop-growth" tool.

In designating a region of critical State concern, the State agency must draw up principles to guide development in the area. The local government then has 6 months to submit land development regulations that will guarantee that these general principles are followed. If the local government and the State agency cannot reach agreement on appropriate regulations, the State is empowered to adopt its own regulations for the area.

The second major technique in Florida's Management Act is the designation of development of regional impact. The Act authorizes the State Land Planning Agency to submit to the next session of the legislature regulations defining categories of development that have regional impact and that should therefore be subject to review at the State level. In particular, the Act refers to development that has a substantial impact beyond the boundaries of any single county. These regulations will take effect when approved by the legislature next year.

Decisions regarding proposals to undertake development of regional impact, or to undertake any development in areas of critical State concern, will continue to be made by local governmental authorities in the same manner as before. But the Division of Planning may appeal those local decisions to the Governor and his cabinet sitting as an adjudicatory commission. In reviewing these cases, the Governor and cabinet are authorized to take into account impacts of the development proposal both outside and within the immediate local jurisdiction.

Virginia also enacted a Land Use Policy Act for critical environmental areas. The Act directs the Division of State Planning and Community Affairs to make a study and report upon control strategies for use in such environmentally sensitive areas as the Division may define.[122]

At the direction of the Governor, the Rhode Island Division of Statewide Planning has undertaken a statewide environmental inventory. Its objective is to gather information needed to make public decisions on land use and development in the State. The Division has also formulated a series of land use policies and implementing programs which it has submitted to the State legislature. Existing statutes and programs have been identified to determine their potential in guiding and controlling land use. But the Division's report concludes that this potential cannot be realized because of the fragmented nature of the statutory provisions and programs. On the basis of this report, the Governor has proposed legislation to coordinate existing State and local laws and programs which influence future development and land use. The proposed legislation would require that all actions taken by the State and local governments conform to State land use and development policies.

In January 1972, Michigan's Natural Resources Commission adopted an interim land use policy. It will guide State action on land use matters in general and the Department of Natural Resources' administration of land and water programs specifically until a formal State plan is adopted. The objective of this policy is to insure that all future development and use of land and water resources are orderly and carefully controlled and in harmony with fundamental environmental values and capabilities. The Commission and the Department of Natural Resources, under the interim policy, will scrutinize proposals that would spur development of private lands adjacent to or surrounded by public lands or would eliminate or restrict public land and water from public use. They also will scrutinize new subdivisions or expansion of existing ones; service facilities for housing developments; business establishments in areas not presently zoned for them; road and utility rights of way; and alterations in natural water courses.

North Carolina enacted a law establishing the North Carolina Council on Goals and Policy.[123] Among the Council's assignments is a study leading to eventual statewide land use planning.

In Arizona, two major study projects are in their initial stages. One envisions a growth policy for the State, including seven elements: a land use and resource analysis, identification of critical environmental issues, assignment of environmental management and protection responsibilities, short-term growth analysis and policy, long-term growth analysis and policy, and administrative and legislative actions. The general goals of the growth policy are to conserve significant resources and areas and to channel urban development into the most appropriate places and forms. The second of these major Arizona projects is a study of the trade-offs between economic development and environmental quality. The State will examine the relationship of pollution to economic growth and will evaluate growth alternatives.

Stabilization and direction of growth have also occupied the attention of other States. Hawaii's Commission on Population is in the process of drafting for submission to the legislature in 1972 a report that will deal with Hawaii's population growth and distribution. In Colorado, the Environmental Commission recommended stabilizing the State's population and developing a plan to distribute the future population of Colorado with consideration for the present and future ecological balance. The Governor of Oregon called for an end to economic expansion and industrial development that sacrifices clean water and air, open space, and wildlife. And in Michigan, the Governor's Advisory Council on Environmental Quality published a report on population policy that urged the State to adopt zero population growth as a goal for the citizens of the State.

Some States have turned to zoning laws and their permit-issuing authorities to control and channel residential and industrial growth. Maine's Site Selection Act, passed in 1970,[124] took effect on September 23, 1971, and is already being tested in the courts. The law is designed to control the development of commercial and industrial sites and other large developments by requiring potential developers to obtain a permit from the Maine Environmental Improvement Commission. The pending suit against the Act springs from the State's refusal to grant a permit for an oil desulfurization plant on grounds that the applicant had failed to show that the operation could be maintained without undue damage to the environment.

In November 1971, California enacted a new law authorizing local governments to deny subdivision building permits on grounds of substantial environmental damage.[125] Oregon issued regulations to bring wildcat subdivisions under control by making subsurface sewage and domestic water sufficiency a matter for prior approval by State health officials.[126]

The Illinois State Pollution Control Board has proposed a permit program for new sewer connections based on projected future development plans in order to forestall overloading of treatment facilities. Connections to already overloaded systems have been banned since May 1971. To help insure that a builder will not proceed too far in his planning only to find that system capacity has been reached, the board in March 1972 adopted procedures to allow builders to reserve capacity by securing permits valid for up to 2 years prior to the start of actual construction.[127]

protecting coastal zones and wetlands—States have continued to recognize the need to protect two especially sensitive ecological areas—coastal zones and wetlands. Florida's Coastal Coordinating Council and Georgia's Coastal Marshland Protection Agency are two examples of special State agencies established to protect coastal resources.

Citizens in Washington State will decide among three shoreline protection alternatives in the November 1972 election. One alternative is voter affirmation of a law that went into effect on June 1, 1971,[128] which would give local governments authority to protect shorelines. A second, Initiative 43A, would give the protection authority to the State. Both proposals would include curbs on various activities in the coastal zone, including controls on offshore oil drilling. A third alternative would be to rescind the current Act and provide no protection at all.

The California Department of Navigation and Ocean Development is developing a comprehensive ocean area plan based on a complete inventory of all present coastline uses and ownership. The plan will also describe coastal zone resources and chart guidelines, criteria, and policies relating to allocation of use. The plan would restrict development in coastal zone areas to activities that depend on the coast.

Both Rhode Island and Oregon took steps to regulate shoreline development. Rhode Island established a Coastal Resources Management Council to safeguard Narragansett Bay, one of the State's major natural resources. A Coast Research Center was established at the University of Rhode Island to give the Council staff and research services. One of the Council's first major tasks is to recommend actions that the State should take on the location of industry on the Bay and along the coastline.

In its 1971 legislative session, Oregon enacted a law [129] creating a Coastal Conservation and Development Commission. The Commission is required to produce a comprehensive study of coastal areas and a plan for zoning those areas. The final plan is to be submitted to the 1975 legislative session.

The Governor of Delaware relied upon the State's Coastal Zoning Law [130] to deny a request by industrial and transportation interests to build a transhipment terminal in Delaware Bay. That law, passed last year, bars all heavy industry, such as petrochemical, steel, and raw pulp, within two miles of the seacoast.

New Jersey's Department of Environmental Protection moved to implement its authority to protect sensitive wetland areas. The Department adopted regulations banning the dumping of garbage, trash or rubbish; the discharging of sewage or industrial waste; the application of persistent pesticides; and the use of vehicles in certain defined wetland areas. The regulations establish a permit system requiring an owner of wetlands to get permission from the Department before engaging in any construction or certain other activities on his land.[131] Five percent of New Jersey's land area consists of tidal salt marsh, which is critical as a nursery to many species of commercial and sport fish and as a feeding ground to hundreds of species of migratory birds.

During the 1972 legislative session, Virginia enacted a Wetlands Protection Bill that permits localities to set up zoning boards to determine the use of wetlands within their jurisdictions. Their model is a sample ordinance spelled out in the bill. The State's Marine Resources Commission will review all decisions and hear all appeals. The Act permits any group of 25 landowning citizens to appeal directly to the commission if they disagree with the ruling of the local zoning boards.[132]

powerplant siting—Five States—Connecticut,[133] Maryland,[134] New York,[135] Oregon,[136] and Washington [137]—now have comprehensive powerplant siting laws. Five other States have taken less comprehensive steps. These are Alabama, Arizona, California, New Mexico, and Texas. Two States—Maine [138] and Vermont [139]—have included powerplants under broad land use powers newly placed at the State level. Several other States, including Illinois, Pennsylvania, and Virginia, have siting legislation pending.

In Texas, a Governor's Advisory Committee on Powerplant Siting was established last summer. The Committee is preparing a report to identify the factors to be considered in establishing criteria for powerplant location. It is expected that the formal report of the Committee will be issued by the fall of 1972 and will contain recommendations for new legislation.[140]

The State laws that have been enacted, as well as the Executive Order issued in California,[141] differ substantially in pattern. Almost all, however, provide for review and approval of proposed powerplant sites by a designated decisionmaking body within the State. Maryland requires long-range planning by utilities and provides for early hearings and site approvals. Maryland also provides for advance State purchase of sites for later resale to the utilities. The Department of Natural Resources in Maryland has responsibility for the program. The Arizona law, administered by the Arizona Corporation Commission, provides for long-range planning by the public utilities and allows for site approval only upon application for a certificate of environmental compatibility.[142]

In a unanimous move, the Governors of three northwestern States—Oregon, Washington, and Idaho—rejected any further development of the Middle Snake River and Hells Canyon as sites for hydroelectric plants.[143] The Governors acted on the assumption that any further facilities would not make a meaningful contribution to solving the region's energy needs but would cause irreparable harm to the Canyon and its great ecological and historical values.

strip mining—A number of States imposed or tightened controls on strip mining. South Dakota,[144] North Carolina,[145] and Montana [146] enacted legislation requiring the reclamation of mined lands. Virginia strengthened its regulatory authority over strip mining operations through new legislation under which applicants are required to provide a reclamation plan before receiving a permit.[147]

Missouri created a Mined Land Conservation Commission to regulate land mining by imposing charges based on acreage and reclamation requirements.[148] The Land Use Regulation Commission was given authority over strip mine operations in Maine.[149]

A new law in Illinois requires bonds to guarantee the cost of strip mine reclamation. The Illinois Act, signed into law in September of 1971, was also designed to require an analysis of potential environmental effects before strip mining may begin. The prospective mine operator must submit a feasible plan for reclaiming land and file a performance bond covering the cost of reclamation. The Illinois Department of Mines and Minerals administers the program, drawing on the Department of Conservation for environmental expertise. The Illinois Institute of Environmental Quality is to monitor the law's progress and report to the Governor and the General Assembly.[150]

In West Virginia, a new law, the Surface Mining and Reclamation Act, prohibits all new strip mining permits for 2 years in 22 of the State's 55 counties. The law also raised the State's reclamation tax on strip mine operators from $30 to $60 an acre. The State must inspect every 15 days and inspectors can order immediate cessation of activities if violations of State law occur. The Director of Natural Resources and State or local prosecuting attorneys can apply for injunctive relief. Each permit application must be accompanied by mining and reclamation plans prepared by a competent professional. Plans must include impounding of all water which flows over or through a disturbed area in order to control silt, acidity, and iron effluents. The operator must also replace all soil and vegetation disturbed by his operations and turn it to a suitable land use.[151]

Arkansas enacted a strip mining control law in 1971 that gives its Department of Pollution Control and Ecology regulatory authority over virtually all minerals, including coal, that are strip mined in the State. A permit system and a bonding requirement were established. Land which is strip mined must be restored as nearly as possible to its original state, including revegetation and smoothed contours.[152]

Ohio also passed a strip mine law that imposed higher fees and stricter requirements for strip mining permits. The new law raised the bond requirements for reclaiming strip mined lands. It also contained provisions to withhold bonds until the State sees tangible proof of attempts to reclaim the land by grading, contouring, and revegetation.[153]

preserving our natural heritage

parks and natural areas

According to the most recent estimates by the National Recreation and Park Association, in 1970 States spent $71.7 million acquiring new lands for State parks. They spent $125.8 million on capital improvements and $186.7 million on annual operations and maintenance—a total expenditure by the States of over $384.1 million for State parks. This compares with $279 million spent in 1967 and $108 million in 1962.

Visits to State parks have increased at an average annual growth rate of about 7 percent. Visitations to State parks in 1970 reached 483 million, of which 431 million were daytime visitors.[154]

The tempo of park acquisition by States has accelerated, due in part to an increasing demand by citizens for additional recreational land to escape from urban environments. The pace of acquisition also has been stimulated by the States' growing awareness that the most suitable land for public use in and around major urban centers was often being lost to private development. Moreover, States have accelerated their efforts to assure that naturally scenic lands are protected from incompatible development.

The ability of the States and local governments to acquire and develop additional park areas has been substantially increased by grants-in-aid from the Land and Water Conservation Fund, which is available to finance 50 percent of the cost of projects proposed by the States. In fiscal year 1972, approximately $255 million was apportioned among the 55 States and territories from the Land and Water Conservation Fund. This is an increase of about $70 million over the fiscal year 1971 apportionment of $185 million.[155]

New York enacted legislation creating an Adirondack Park Agency to assure that all uses of the land within the Adirondack Park boundaries, whether public or private, will remain compatible with the environmental character of the Park itself. The agency is also charged with the development of a land use plan, which not only provides a continuing role for local government but recognizes the major State interest in conservation, use, and development of the Park's resources.[156]

Virginia, Nevada, and Wisconsin are typical of other States which are moving vigorously to acquire new lands for park and recreation purposes. Included in Virginia's fiscal 1972-74 budget are plans by the Commission of Outdoor Recreation to acquire one new State park, develop five, and complete acquisition of three others. Nevada enacted legislation authorizing the acquisition of land for 11 new sites and additions to 9 existing areas.[157] And Wisconsin during the past year acquired an additional 3,703 acres of park land and

1,512 acres of forest land, including 634 acres acquired in three units of the Ice Age National Scientific Reserve.

New Jersey voters in a November 1971 election approved an $80 million "Green Acres" program of land purchases to preserve open spaces, protect wetlands and reserve land for future parks. The first purchases of land under this program began in February 1972. The largest parcel was an 8,000-acre section of wetlands along the Atlantic coast.

Massachusetts moved to protect the scenic quality of its rivers. The Scenic Rivers Corridor Preservation Act empowers the State's Department of Natural Resources to issue regulatory restrictive orders affecting all land within 100 yards of scenic rivers without compensation to the landowners. An order becomes a permanent encumbrance on the property unless a court on appeal determines that the order is a taking of property for which compensation is required.[158]

Maine enacted legislation in June 1971 to regulate the development of its wild lands. The new law will give its Land Use Regulation Commission authority over development of about 42 percent of the State, or about 10 million acres. The focus of the commission's activities will be on safeguarding the wilderness areas against "irresponsible" recreational development, strip mining, and other such activities which might overburden and destroy water and land resources.[159]

Michigan acted in two ways to protect natural areas. First, it created a Natural Areas Advisory Council to establish categories of land use and recommend specific programs to the Department of Natural Resources.[160] Second, it enacted a Natural Rivers Act in late 1970.[161]

Oregon, through administrative action by its Environmental Quality Commission, has drastically curbed harmful mining activity in its wilderness areas. Permits are granted to mine operator applicants only if air emissions are kept below 5 percent opacity; if water waste discharges do not cause any measurable increase in color, turbidity, temperature, or bacterial contamination; if there is no measurable effect on dissolved oxygen; and if noise emissions are kept below 60 decibels.

Oregon and Connecticut employed other means to protect and preserve natural areas. Oregon joined the list of States that have extended property tax relief as an incentive to preserve open spaces.[162] Connecticut provided for reduced tax rates for privately owned land that is preserved for open spaces, wetlands, farmland, and forests. This year the State established procedures to recapture those tax benefits if the land is later converted to other purposes.[163]

protecting wildlife

Eighteen States now have some form of legislation to protect and preserve threatened or endangered wildlife. State legislation to protect endangered species is especially important because Federal law does not currently grant legal authority to Federal agencies to protect endangered species except on Federal lands. In his February 1972 Environmental Message, the President proposed an Endangered Species Act of 1972 that would grant such authority to the Federal Government. The Department of the Interior and the International Association of Game and Fish Conservation Commissions are working together to develop model State legislation in this area.

One of the principal objectives of the proposed model legislation is to have States protect animals on the Federal endangered species list and to authorize a responsible State agency to protect animals facing extinction within the State.

California [164] and Maryland [165] already have such laws. The Maryland law, which took effect in April of 1971, recognizes the Federal list and, in addition, protects eight State animals—black bears, coyotes, wildcats, bobcats, porcupines, mountain lions, Delmarva Peninsula fox squirrels, and weasels. The Federal list of endangered animals now totals 101 species—14 mammals, 50 birds, 7 reptiles, and 30 fish species.

The Texas legislature enacted legislation protecting endangered species, but it failed to receive the Governor's approval.[166] In his veto message, the Governor cited certain faults in the legislation that would not have provided sufficient protection to certain species in Texas. He predicted that improved legislation would be passed in the next session. Nevada passed a law giving its Fish and Game Department responsibility for protecting the habitat of endangered wildlife as well as the wildlife itself.[167] Illinois and Michigan both have bills pending on this same subject.

increasing citizen involvement

More States are experimenting with new devices to allow citizens to join in the fight against pollution.[168] The Michigan law [169] cited in the Second Annual Report last year, which granted private citizens broad rights to go to court against conduct that "will pollute, impair, or destroy the air, water, or other natural resources or the public trust therein," was the forerunner of several similar laws subsequently enacted by other States.

Minnesota during the summer of 1971 enacted an Environmental Rights Act.[170] Under this law, citizens can bring civil actions in the name of the State against any person to protect the air, water, land, or natural resources located in the State. Massachusetts in September 1971 passed the Citizen's Right to Action Act.[171] The law will permit any 10 citizens to bring suit against a polluter if State or local pollution control agencies are not requiring the polluter to comply with antipollution regulations. Connecticut,[172] Indiana,[173] and California [174] have also enacted laws based in part on the Michigan statute.

Citizen involvement was significantly increased and encouraged in Pennsylvania during 1971. Citizens' pollution patrols were organized in various parts of the State. Training sessions were held by the State in cooperation with the Federation of Sportsmen's Clubs to instruct citizens how to collect evidence to help enforce pollution control laws. Working arrangements were developed with a group of law students in the Philadelphia area and with a group of citizens and students in the Pittsburgh area. The law students will prepare cases for enforcement actions and actually represent the State Department of Environmental Resources before local magistrates. The Pittsburgh group provides surveillance on major rivers and collects data for prosecutions by the department.

summary

Through a gradual process of experimentation, testing, and building, the States during 1971 have exhibited their mounting commitment to preserve and enhance the environment. Development of laws to control pesticides, regulate noise, and reduce pollution and implementation of existing laws have demanded the largest share of State energies, but the States also have demonstrated that they are able and willing to meet other environmental problems as well. Comprehensive land use planning, reservation of land for open space, preservation of endangered species, protection of wetlands and ocean fronts, analysis of the environmental impact of State actions, and organizations to focus manpower and resources on critical environmental problems were among the other actions on State environmental agendas. But gaps still remain. Cumbersome and duplicative laws, deficiencies in staffing—both in numbers and qualifications—and, in some cases, the hesitancy of some local enforcement officials to enforce their laws uniformly throughout their jurisdictions are weaknesses that need attention and strengthening.

As last year's report indicated, States serve as experimental laboratories for a variety of solutions to common problems. States must innovate to deal with the myriad of environmental problems and decisions faced by them. They have not hesitated to develop their own solutions or adopt solutions found by other States to meet common problems. The willingness of States to innovate and to emulate other new programs, organizations, and authorities to improve the environment is one of the most creative aspects of our federal system today.

footnotes

1. Pa. Const. art. 1, § 27.
2. N.M. Const. art. 20, § 21.
3. Ch. 630 (1971), Sess. Laws of N.C.
4. U.S. Bureau of Census, Department of Commerce, State and Local Government Special Studies No. 6: "Environmental Quality Control" (1972), p. 7.
5. Ch. 658 and ch. 659, N.Y. Laws of 1972.
6. Gen. and Spec. Laws of Tex., 62d Legis., Reg. Sess. 1971, p. 3845.
7. Act 11F, § 11(b) (1971), Pub. Acts of Vt.
8. Ore. Rev. Stat. § 449.672 (1971).
9. Ch. 20 (1971), Minn. Laws, Extra Sess.
10. S.B. 596, 76th Gen. Assembly of Mo., 2d Sess. (1971).
11. Ch. 125, Wis. Laws of 1971.
12. S.B. 648, 1971 Sess. of Mich. Legis.
13. Ch. 148, R.I. Gen. Laws of 1971.
14. Ohio Rev. Code § 5749.01–.16.
15. 37 Fed. Reg. 10842 (1971).
16. Ch. 619, Gen. and Spec. Laws of Tex., Acts. of 62d Legis., Reg. Sess. 1971, amending Vernon's Ann. Civil Stat. 4477–5.
17. Act 769 (1971), Ala. Laws Reg. Sess.
18. 3 Tenn. Code Ann. §§ 53–3412 to 53–3414(1).
19. 3 Tenn. Code Ann. § 3415(D)(C).
20. Clean Environment Act, Proposition 9, Cal. Initiative, voted on June 6.
21. Id., § 8.
22. 42 U.S.C.A. § 1857f–6a.
23. Cal. Health and Safety Code § 39177.1(a) (West 1971).
24. Ch. 15, N.J. Air Pollution Control Code (1972).
25. S.C.R. 261 (1971) Reg. Sess. of La. Legis.
26. Ore. Rev. Stat. § 449.953 (1971).
27. Wash. Rev. Code § 90.54.
28. Ch. 347, Idaho Laws of 1972.
29. Ga. Code Ann. § 17–5, as amended, Act 1484, S.B. 493 and Act 1485, S.B. 494 of 1972 Sess. of Ga. Gen. Assembly, and Ga. Code Ann. § 88–26 (Supp. 1966).
30. Act 1483, H.B. 491 of 1972 Sess. of Ga. Gen. Assembly.
31. Tenn. Code Ann. § 70–324 to 70–342.
32. Ill. Rev. Stat. ch. 111.5, § 1003.
33. N.J. Pamphlet Law 1971, c. 173.
34. Alaska Stat. § 46.03.760(a).
35. Fla. Stat., ch. 376 (1970), §§ 9 of § 376.031 as amended, ch. 71–243 and §§ 1 and 2 as amended, ch. 71–136.
36. American Waterways Operators v. Askew, 335 F. Supp. 1241 3 ERC 1429 (M.D. Fla., 1971) probable jurisdiction noted, 40 U.S.L.W. 3504 (1972).
37. Me. Rev. Stat. Ann. tit. 38, ch. 3, subch. II–a, § 541–557, as amended, ch. 618 (1971) Spec. Sess. except § 543, 552 and 553.
38. Me. Rev. Stat. Ann. tit. 38, ch. 3, § 413 as amended, ch. 618, § 12 (1971) Spec. Sess.
39. Wash. Rev. Code § 90.52.
40. N.J. Pamphlet Law 1972, ch. 42.
41. S.B. 118, 1971 Nev. Legis. repealed and incorporated into A.B. 811, 1971 Nev. Legis.
42. Act 1260 (1971) Ala. Laws, Reg. Sess.
43. 10 V.S.A. § 912a(c)(3)(A).
44. 10 V.S.A. § 912a(f).

45. Ch. 17 (1971); Minn. Laws, Extra Sess. and ch. 861 (1971), Minn. Laws, Reg. Sess.
46. Ind. Code § 6–6–1.5–1 to 1.5–4 (1971).
47. Ch. 184 (1971), N.H. Laws.
48. Minn. Reg. SW 51–55.
49. Ind. Code § 13–1–5.7–1 to 5.7–7 (1971).
50. S.D. Comm. on Water Pollution, regulation of Livestock Enterprises for Water Quality control (1971).
51. Ohio Rev. Code § 6121.041–.043.
52. Ohio Rev. Code § 1531.29.
53. N.H. Rev. Stat. Ann. § 149–G.
54. 18 CFR 601.32–3.
55. M. Garner, Approaches to Urban and Rural Erosion and Sediment Control—Administrative and Legislative Actions to Extend State Programs (U.S. Department of Agriculture unpublished paper), p. 1, May 1972.
56. Ala., Ark., Colo., Fla., Ga., Ill., Ky., La., Md., Miss., Mont., Neb., Nev., N.J., N.C., N.D., Oreg., S.C., S.D., Tenn., Tex., Utah, Vt., Va., W. Va., Wis., Wyo.
57. *Id.* p. 2.
58. Ch. 227 (1971), Acts of 64th Gen. Assembly of Iowa, 1st Sess.
59. Amended S.B. 305, 109th Ohio Gen. Assembly, 1971–72.
60. 12. V.I. Code § 531–58.
61. Md. Ann. Code art. 25, §§ 163a, 167B(A); art. 66c, §§ 411AB, 411AD, 756–756A, 757A–B, art. 96A, §§ 105–110.
62. Ch. 664, N.Y Laws of 1972.
63. § 25–54 to 25–54qq (1971 Supp.), Conn. Gen. Stat.
64. Me. Rev. Stat. Ann., tit. 39, ch. 3, § 419 (1971).
65. Mich. Comp. Laws § 323.231–323.236.
66. Ch. 72–53, adding § 403.061 to ch. 71–35 of Fla. Stat.
67. Ind. Code § 13–1–5.5–2 and 3 (1971).
68. H.B. 1336, 1971 Ore. Legis.
69. H.R. 48, 1971 Ark. Legis. Sess.
70. H. Jt. Res. 33, 1971 Mont. Legis. Assembly.
71. Ch. 245, R.I. Gen. Laws of 1971.
72. N.J. Pamphlet Law 1971, ch. 177.
73. New Jersey Department of Environmental Protection, *Plain Facts about New Jersey's Environment—Ocean Dumping* (1971).
74. Ore. Rev. Stat. § 459.120–.160 (1971).
75. Mich. Comp. Laws § 325.291–325.300.
76. Nev. Rev. Stat. § 444.440–444.620.
77. Ch. 745 (1971) Ore. Laws.
78. 10 V.S.A. § 1171–1175.
79. N.J. Pamphlet Law 1971, ch. 418.
80. 23 N.D. Cent. Code § 23–01–17.
81. Ill. Rev. Stat. ch. 111.5, § 1025.
82. Colo. Rev. Stat. § 66–35 (Supp. 1971).
83. Ch. 62, Mass. Acts of 1971.
84. P.A. 74 (1968) as amended, P.A. 178 (1971) and Mich. Comp. Laws § 257.1504c added by P.A. 57 (1972).
85. 13 V.S.A. § 3738–3740.
86. Northern States Power Co. v. Minnesota.
87. Mont. Rev. Code Ann. § 27–213 to 27.245.
88. N.H. Rev. Stat. Ann. § 149–D:7 and D:9.
89. Mich. Comp. Laws § 286.151–286.173.
90. N.J. Pamphlet Law 1971, ch. 176.
91. Ch. 832 (1971), Sess. Laws of N.C.
92. Cal. Agric. Code § 12991.
93. Act 1303, H.B. 571 of 1972 Sess. of Ga. Gen. Assembly.

94. Del. Code Ann. tit. 3, ch. 12–2 as amended H.B. 350, Reg. Sess. (1972).
95. Act 1957, § 5 of H.B. 1851 of 1971 Ala. Legis., Reg. Sess., as amended, Act 79, H.B. 119 of 1971 Ala. Legis., 3d Spec Sess.
96. Ind. Code § 15–3–3.5–1 to 3.5–36 (1971).
97. Ch. 308, Gen. and Spec. Laws of Tex., Acts of 62d Legis., Reg. Sess. 1971, amending Vernon's Ann. Civil Stat. 135b–5.
98. Utah Code Ann. (1953) Rept. Vol. 1B, 4–4–30.
99. Conn. Agency Reg. § 19–300–P–17 to 19–300–P–19.
100. Neb. Rev. Stat. § 81–1501 to 1532 (1971) as amended, L.B. 1435, 82d Legis., 2d Sess. at p. 1229 (1972) Laws of Nebraska.
101. Ch. 277, N.M. Laws of 1971.
102. Conn. Gen. Stat. Ann. § 22a–1—§ 22a–11 (1971 Supp.) as amended, Spec. Act 53, § 15 (1972).
103. Act 38, § 8 (1971) Ark. Legis. Sess.
104. Alaska Stat. § 46.03.020.
105. S.C.R. 262 (1971) La. Legis., Reg. Sess.
106. Mont. Rev. Code Ann. § 69–6501—69–6517.
107. Wash. Rev. Code § 43.21C.
108. Del. Code Ann., tit. 7, ch. 70.
109. N.M. Stat. Ann. § 12–20–1—12–20–7 (1971).
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122. Ch. 690 (1972), Va. Acts of Assembly.
123. N.C. Gen. Stat. § 143–476.
124. Me. Rev. Stat. Ann., tit. 38, § 481–488 as amended, ch. 618, 613, 622 (1971) Spec. Sess.
125. Cal. Bus. & Prof. Code § 11549.5 (West 1971).
126. OAR, ch. 339 (1972).
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128. Wash. Rev. Code § 90.58.
129. Ore. Rev. Stat. § 191.110–.180 (1971).
130. Ch. 175, Vol. 58, Laws of Del.
131. N.J. Dep't of Environmental Protection, Reg. adopted April 13, 1972 under N.J.S.A. 13:9A–1 et seq.
132. Ch. 711 (1972), Va. Acts of Assembly.
133. Conn. Gen. Stat. Ann. § 16–50g–§ 16–50w (1971 Supp.) § 16–50j as amended, P.A. 228 (1972); § 16–50q as amended, P.A. 108, § 3 (1972).
134. Md. Code Ann. art. 66(c) § 763–768 (1957; Supp. 1971).
135. Chapter 385, N.Y. Laws of 1972.
136. Ore. Rev. Stat. § 453.305–.575 (1971).
137. Wash. Rev. Code § 90.58.
138. Me. Rev. Stat. Ann. tit. 38 § 481–488 as amended ch. 618, 613, 622 (1971) Spec. Sess.
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142. Ariz. Rev. Stat. Ann. § 40–2–6.2—40–360—40–360.2 with § 4360 and 4360.1 as amended, ch. 87, Ariz. Laws of 1972.
143. Letter from Governors of Idaho, Oregon and Washington, June 15, 1971, to Chairman, Federal Power Commission.
144. S.D. Compiled Laws Ann. § 45–6A (1971).
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146. Mont. Rev. Codes Ann. § 50–1018—50–1033 and § 50–1201—50–1224 (1971).
147. Ch. 785 (1972), Va. Acts of Assembly.
148. Mo. Rev. Stat. § 444. with § 444.500—444.755 added by S.B. 1, 76th Gen. Assembly, 1st Reg. Sess. and § 444.760—444.786 added by H.B. 519, 76th Gen. Assembly, 1st Reg. Sess.
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161. Mich. Comp. Laws § 281.761–281.776.
162. Ore. Rev. Stat. § 308.740–308–790 (1971).
163. Conn. Gen. Stat. Ann. §§ 7–131a–D (1969 Supp.) Conn. Gen. Stat. Ann. §§ 12–53–A, § 12–63, §12–76, § 12–78, § 12–107a to 12–107c, and § 12–109 (1971 Supp.) P.A. 152 (1972) Conn. Gen. Assembly.
164. Cal. Fish & Game Code § 2050–55 (West 1971).
165. Md. Code Ann. art 66(c) § 125 (1957 Supp. 1971).
166. S.B. 172, Gen. and Spec. Laws of Tex., 62d Legis., Reg. Sess. (1971).
167. Nev. Rev. Stat. § 611 (1971).
168. See Council on Environmental Quality, *Environmental Quality Second Annual Report*, 1 p. 56 (1971).
169. Mich. Comp. Laws § 69.1201–69.1207.
170. Ch. 952 (1971), Minn. Laws, Reg. Sess.
171. Mass. Gen. Laws Ann. ch. 732 (1971) as amended, ch. 219, Mass. Acts of 1972.
172. P.A. 96 (1971) Conn. Gen. Assembly added to Conn. Gen. Stat. Ann. § 22a–14 thru § 22a–20 (1971 Supp).
173. P.L. 182, Ind. Acts of 1971, added to Ind. Code §§ 13–6–1–1 to 6.
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appendix

funding and manpower for water and air quality agencies

Table A—1

Funding for State Air Pollution Control Agencies, FY 1971

State	Federal Funds	State Funds	Local Funds	Total Funds	Man-years	
					1971	1972
Alabama	14,642	----------	18,851	33,493	12	24
Alaska	120,334	38,800	51,470	210,604	6	6
Arizona	350,490	235,128	189,221	774,839	47	54
Arkansas	276,729	136,000	----------	412,729	10	12
California	2,440,604	6,399,601	8,104,315	16,944,520	635	700
Colorado	615,996	378,651	234,491	1,229,138	56	72
Connecticut	709,523	291,911	263,981	1,265,415	56	87
Delaware	234,314	173,931	----------	408,245	21	21
District of Columbia	234,134	117,068	----------	351,202	19	24
Florida	902,370	572,392	376,754	1,851,516	123	146
Georgia	532,460	313,793	89,508	935,761	65	71
Hawaii	----------	----------	----------	----------	14	14
Idaho	60,000	137,808	----------	197,808	2	11
Illinois	1,412,000	947,200	1,883,375	4,242,575	291	364
Indiana	298,781	----------	437,409	736,190	71	94
Iowa	367,485	141,717	29,916	539,118	29	39
Kansas	354,658	104,011	65,232	523,901	31	32
Kentucky	514,870	335,902	202,062	1,052,834	76	76
Louisiana	399,208	225,535	----------	624,743	16	46
Maine	96,000	60,750	----------	156,750	5	9
Maryland	1,425,688	430,657	558,642	2,414,987	169	191
Massachusetts	1,240,000	207,500	367,028	1,814,528	61	60
Michigan	1,821,978	348,273	705,473	2,875,724	116	164
Minnesota	216,708	----------	229,358	446,066	46	50
Mississippi	80,000	64,000	----------	144,000	6	13
Missouri	948,062	161,745	623,908	1,733,715	85	93
Montana	239,007	103,834	34,934	377,775	17	30
Nebraska	123,359	25,824	25,613	174,796	8	14
Nevada	191,827	15,163	131,634	338,624	26	28
New Hampshire	81,381	51,140	----------	132,521	7	7
New Jersey	2,081,923	1,212,602	133,243	3,427,768	177	180
New Mexico	127,591	----------	45,405	172,996	23	40
New York	2,628,565	3,192,314	5,592,112	11,412,991	630	632
North Carolina	805,503	271,036	299,751	1,376,290	81	121
North Dakota	45,000	19,660	----------	64,660	4	5
Ohio	1,047,840	----------	1,240,000	2,287,840	129	201
Oklahoma	223,479	82,005	220,465	525,949	21	61
Oregon	569,181	385,784	317,855	1,272,820	57	77
Pennsylvania	2,974,300	1,454,332	1,523,613	5,952,245	256	332
Rhode Island	117,107	86,233	----------	203,340	12	16
South Carolina	356,173	332,125	70,155	758,453	44	68
South Dakota	21,000	7,000	----------	28,000	3	6
Tennessee	897,118	334,830	317,533	1,549,481	100	103
Texas	1,637,634	394,184	531,858	2,563,676	182	394
Utah	176,778	135,252	----------	312,030	17	24
Vermont	128,625	69,200	----------	197,825	6	8
Virginia	628,974	247,899	169,355	1,046,228	42	97
Washington	1,108,719	818,345	567,090	2,494,154	85	116
West Virginia	387,308	396,250	14,322	797,880	25	51
Wisconsin	100,000	224,000	13,220	337,220	14	77
Wyoming	68,016	34,722	----------	102,738	4	6
Guam	42,714	23,507	----------	66,221	1	3
Puerto Rico	----------	----------	----------	----------	25	32
Virgin Islands	72,094	41,168	----------	113,262	4	6
Total	32,548,250	21,780,782	25,679,152	80,008,184	4,068	5,208

U.S. Environmental Protection Agency

appendix

Table A—2

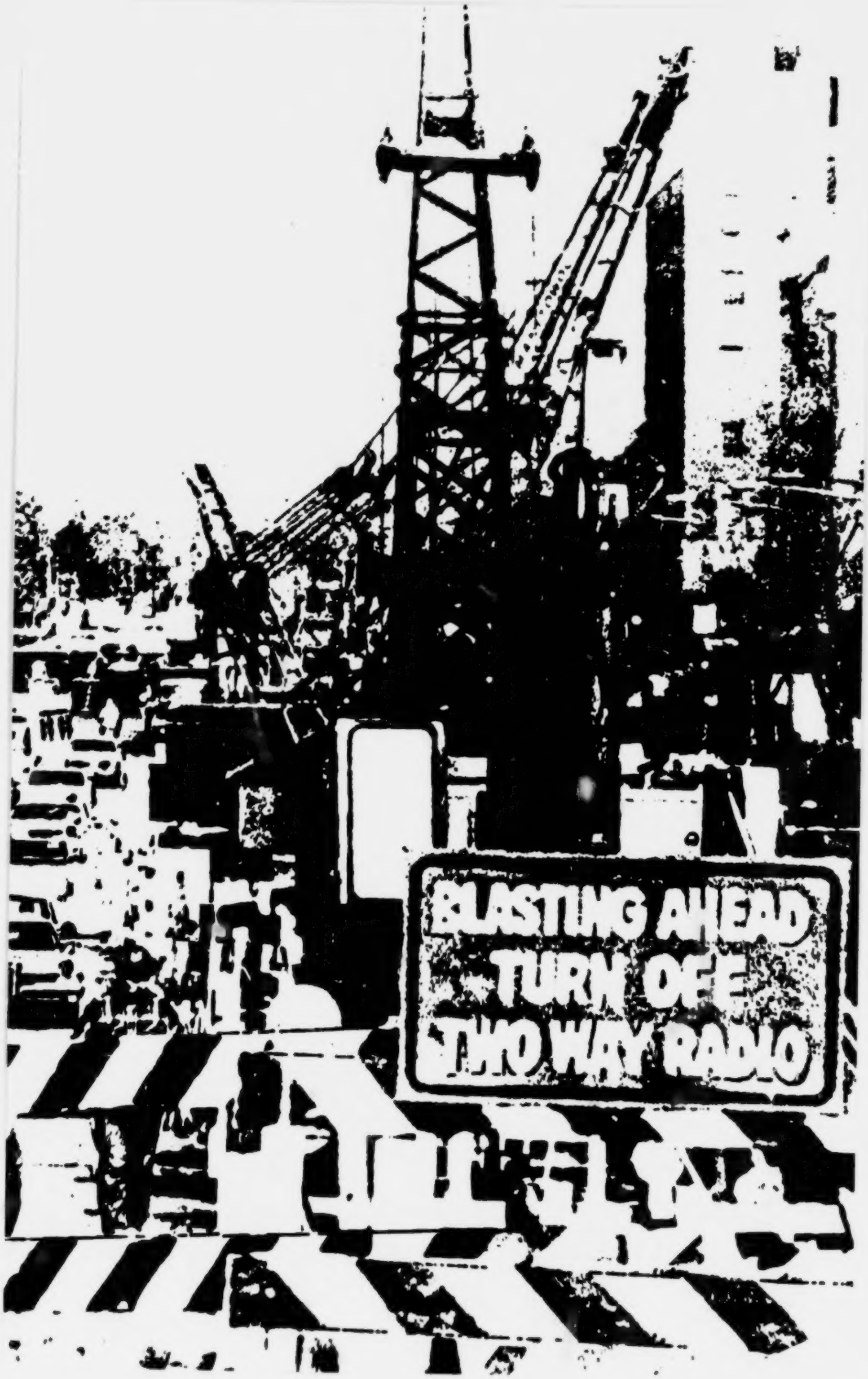
Funding and Manpower for State Water Quality Agencies, 1971–72

State	Fiscal year 1971 Funding			Fiscal year 1972 Budgeted			Fiscal year 1971 man-years	Fiscal year 1972 man-years
	Federal	State	Total	**Federal	State	Total		
Alabama	157,178	200,054	357,232	184,900	158,750	343,650	22.20	29.90
Alaska	20,061	140,420	160,481	20,400	127,900	148,300	15.00	7.00
Arizona	74,115	133,779	207,894	76,800	81,310	158,110	11.00	11.50
Arkansas	117,139	175,407	292,546	112,600	345,500	458,100	35.00	44.00
California	670,186	4,384,000	5,054,186	672,000	4,934,000	5,606,000	192.30	314.50
Colorado	89,013	218,899	307,912	90,900	341,415	432,315	21.00	25.00
Connecticut	169,591	394,170	563,761	167,500	387,508	555,008	64.00	49.40
Delaware	86,942	258,053	344,995	86,000	238,300	324,300	33.20	32.00
District of Columbia	88,827	294,590	383,417	86,800	398,224	485,024	63.80	47.90
Florida	269,872	*800,000	*1,069,872	276,800	836,603	1,113,403	72.00	87.00
Georgia	221,619	518,414	740,033	213,800	675,200	889,000	50.00	55.00
Hawaii	71,923	98,315	170,238	69,000	330,900	399,900	31.00	31.30
Idaho	44,547	269,321	313,868	43,900	216,552	260,452	20.30	17.00
Illinois	433,772	1,757,248	2,191,020	430,900	1,791,248	2,222,148	188.00	154.00
Indiana	232,927	382,100	615,027	233,800	535,024	768,824	56.80	63.22
Iowa	122,737	131,160	253,897	123,300	170,400	293,700	22.75	30.50
Kansas	98,818	329,481	428,299	95,900	478,100	574,000	49.61	37.50
Kentucky	165,393	346,474	511,867	164,000	344,950	508,950	45.80	40.60
Louisiana	186,514	415,877	602,391	179,600	428,641	608,241	49.00	50.20
Maine	63,664	366,696	430,360	63,600	521,512	585,112	29.00	32.80
Maryland	183,748	1,211,007	1,394,755	183,900	1,793,990	1,977,890	82.60	111.20
Massachusetts	268,125	459,188	727,313	267,800	1,132,363	1,400,163	58.00	58.00
Michigan	362,587	822,514	1,185,101	360,100	1,556,895	1,916,995	95.50	117.00
Minnesota	157,424	692,745	850,169	158,000	1,385,002	1,543,002	60.00	84.75
Mississippi	145,100	150,099	295,199	137,200	173,852	311,052	25.00	23.40
Missouri	199,231	261,599	460,830	197,400	249,972	447,372	31.50	31.50
Montana	39,417	59,783	99,200	39,500	195,381	234,881	7.00	15.50

Nebraska	67,126	96,593	163,719	67,700	173,023	240,723	11.90	17.20
Nevada	23,000	64,000	87,000	25,500	36,200	61,700	5.71	6.20
New Hampshire	64,251	493,386	557,637	64,900	555,535	620,435	66.00	56.00
New Jersey	316,176	541,558	857,734	312,200	912,936	1,225,136	88.90	105.40
New Mexico	52,848	34,925	87,773	53,100	183,814	236,914	14.60	23.10
New York	659,316	3,982,562	4,641,878	645,400	4,665,269	5,310,669	300.00	216.00
North Carolina	268,125	534,009	802,134	258,400	614,778	873,178	57.00	64.70
North Dakota	37,581	27,700	65,281	37,400	31,100	68,500	5.85	6.60
Ohio	453,429	875,954	1,329,383	447,800	1,085,041	1,532,841	60.00	87.00
Oklahoma	119,062	181,098	300,160	118,000	263,710	381,710	31.90	33.60
Oregon	98,119	501,545	599,664	98,900	649,585	748,485	41.80	48.75
Pennsylvania	494,928	1,975,148	2,470,076	489,400	4,052,180	4,541,580	170.81	372.71
Rhode Island	112,391	188,362	300,753	108,800	219,100	327,900	32.60	27.40
South Carolina	159,417	439,612	599,029	151,000	468,629	619,629	43.00	55.00
South Dakota	38,841	53,020	91,861	38,900	58,014	96,914	8.70	9.30
Tennessee	210,892	278,526	489,418	204,300	778,100	982,400	37.50	59.50
Texas	432,787	1,419,699	1,852,486	424,600	3,668,346	4,092,946	145.00	275.00
Utah	56,009	95,591	151,600	56,100	136,714	192,814	12.67	15.00
Vermont	44,160	353,889	398,049	44,200	339,989	384,189	23.00	35.00
Virginia	213,349	1,116,190	1,329,539	208,400	1,178,490	1,386,890	100.00	114.00
Washington	137,992	975,254	1,113,246	137,300	1,157,700	1,295,000	73.50	73.50
West Virginia	111,600	211,947	323,547	107,600	530,631	638,231	28.50	40.10
Wisconsin	195,516	1,148,235	1,343,751	199,500	1,709,800	1,909,300	83.00	88.00
Wyoming	23,797	47,085	70,882	24,200	47,800	72,000	3.00	3.60
Guam	65,800	98,700	164,500	74,300	65,505	139,805	10.60	14.00
Puerto Rico	197,463	•190,810	•388,273	192,500	144,000	336,500	36.95	35.70
Virgin Islands	59,000	47,446	106,446	73,200	36,600	109,800	10.90	11.40
Total	**9,453,445**	**31,244,237**	**40,697,682**	**9,400,000**	**43,592,081**	**53,992,081**	**2,934.75**	**3,495.43**

U.S. Environmental Protection Agency

•Estimated
••Additional $4,700,000 authorized—revised budgets to show increase in State funds not received.


BLASTING AHEAD
TURN OFF
TWO WAY RADIO

6 local governments — efforts to control noise

Long before the problems of pollution rose to their present proportions of State- and nation-wide significance, local units of government were grappling with smoke emissions, polluted rivers, rising levels of noise, and mounting volumes of solid wastes.

Two basic factors provide a natural role for the local level of government in controlling pollution. First, like the States, local governments traditionally have had more extensive legal authority to confront environmental problems than the Federal Government. State and local authorities can enact legislation based on their broad constitutional police power to protect the public health, safety, and welfare. In addition, armed with common law powers, localities historically have acted to control public nuisances. Second, local jurisdictions are closest geographically and jurisdictionally to many of the environmental problems jeopardizing the health and welfare of their citizens.

The vast expansion of our urban areas and the increasingly regional character of many environmental problems are focusing new attention on action at the regional, State, and Federal levels of government. But a better understanding of past and present local efforts to meet these problems will help put the responsibilities and functions of all levels of government in perspective.

Unfortunately, the history of local environmental regulation does not lend itself to broad or easy description or analysis. This Annual Report takes a first step toward understanding the local role in attacking environmental problems. It examines in some detail past and present local activity in dealing with one significant problem—noise pollution. Noise regulation is a good example of a struggle against pollution that traditionally has been waged locally but is now increasingly attracting the attention of State and Federal governments. Considerable information about noise is now available because of a recent study by the Environmental Protection Agency [1] and a broader study on local activities commissioned by the Council on Environmental Quality.[2]

Although this chapter centers on local efforts to regulate noise, it discloses issues common to local environmental regulation on other fronts as well. The issue of preemption by State or Federal laws, for one, is well illustrated in the case of noise pollution, for which pending Federal legislation and new State programs eclipse local efforts to some extent. Indeed, as more State and Federal programs and more uniform approaches to particular pollution issues emerge, the local role may come under significant reexamination.

Before describing the local war against noise pollution, this chapter will first summarize briefly the traditional and emerging local role in several other major areas of environmental concern. This summary is intended to put the changing interface among local, State, and Federal functions into perspective.

air pollution

Early efforts to combat air pollution represented local response to citizen clamor over what today is recognized as only one aspect of air pollution—smoke emissions from fossil fuels, primarily coal. Chicago and Cincinnati led the way with smoke control laws in 1881. By 1912, 23 of the 28 cities with populations over 200,000 had similar laws.[3] Although specific State enabling legislation sometimes was needed [4] and a few States involved themselves directly in control programs,[5] regulation for the most part remained a local concern until the mid-fifties. Even on the local level, however, air pollution control up to the middle of this century continued to be primarily a matter of controlling smoke through local ordinances.

The Federal Government entered the field after California discovered in the early fifties that automobiles were the chief source of Los Angeles smog. Smog itself was not recognized as a serious air pollution problem until the late 1940's. It took years of research to pinpoint the source of photochemical smog and to demonstrate that the problem was not unique to Los Angeles. The resulting new emphasis on gaseous pollutants, coupled with the realization that the problem should no longer be thought of as essentially local in character,[6] moved pollution control efforts away from local smoke ordinances. Soon all three levels of government were engaged in a variety of broad programs. The Federal Clean Air Act, originally passed in 1963,[7] was broadened in 1965,[8] 1967,[9] and particularly in 1970 [10] to shore up State and Federal control over air pollution.

The impact of this broadening movement on local responsibilities has been twofold. First, the new Federal mandate under the Clean Air Act to set air quality standards and the accompanying State assignment to implement them have significantly eclipsed local responsibility to determine permissible pollutant levels. But while much of the control over air quality standards has moved to governmental levels above the local, the responsibility for actual enforcement of the standards and for translating them into emission limitations and compliance schedules is still largely delegated to the local level in many States. Thus, the role played by many local jurisdictions is still a crucial one.

The success of local efforts to control air pollution is mixed, but there is a trend toward improvement. Two early studies in 1963 indicate that local programs, where they existed, were understaffed and lacked the money to properly meet their needs.[11] More recently, some local governments have made notable efforts to improve the quality of enforcement. For example, New York City's Environmental Control Board in the first 6 months of its existence in 1971 handed down twice as many fines for air pollution as the City's criminal courts levied in all of 1970 under the old enforcement system.[12] And, although still facing a serious problem of auto-made smog, Los Angeles County has implemented stringent controls over stationary source emissions. Philadelphia's air pollution control program is another example of significant progress in the last decade. With further improvement in local enforcement programs, there is every reason to believe that local governments will continue to play an important role in meeting the Nation's air quality improvement goals.

water pollution

Water pollution control also started as a simple response by local jurisdictions to only a part of what has since become a complex and difficult environmental problem. Environmental controls over water quality were originally designed to protect surface and underground sources of drinking water from contamination by human waste disposal. With the rise of urban centers and sewer systems, the focus has broadened to protecting rivers, lakes, estuaries, and the oceans themselves. By the turn of the century, health codes—forerunners of modern water quality laws—began to reflect these concerns.[13] Today, water pollution control efforts are aimed as well at enhancing aesthetics and recreation and at protecting fish and wildlife.

Again, cities historically were the first to react to both problems. Unlike the case of air pollution, however, the States soon played the dominant legal role in water pollution control, as they now have for many decades, largely because water pollution has major downstream impacts well beyond the local jurisdictions where it originates. By the time of Federal entry on the scene in 1948,[14] most States had some form of water pollution control program underway. Local jurisdictions, however, have continued to bear a preponderance of the financial load in trying to respond to increasingly strict State and Federal requirements applicable to their sewage treatment systems.

The local government contribution to the fight against water pollution has been chiefly in constructing and operating municipal waste treatment systems. In the face of spiraling demands for a wide variety of municipal services, local efforts to construct such waste treatment systems have been uneven and sometimes prodded only by threats of enforcement. Nevertheless, between 1957 and 1970, local governments, with Federal and State aid, have invested $6.4 billion in treatment plants.[15] Considerably more funds have gone into operating costs. Some localities have made impressive gains, often by establishing regional waste treatment authorities. Seattle, for example, with a metropolitan-wide system, restored eutrophic Lake Washington to recreational quality. San Diego restored the quality of its Bay through a regional system. And the Metropolitan Sanitary District of Chicago is innovating in advanced abatement techniques, including an underground tunnel to cope with combined sewer overflow wastes. With rising citizen concern over the quality of the environment and stepped-up Federal and State assistance and enforcement, local government spending to control water pollution will grow.

solid waste

Solid waste, unlike air and water pollution, remains substantially a problem of local control and concern. Federal initiatives in this area, primarily the Solid Waste Disposal Act of 1965,[16] as amended by the Resource Recovery Act of 1970,[17] are essentially limited to demonstration and planning grants, technical aid, and information guidelines. Most States, spurred in part by Federal assistance, have developed comprehensive solid waste plans. Thirty States now have solid waste control laws and 26 require permits.[18] In many of these States, however, local governments handle the actual program development and implementation, with the States lending various forms of assistance. Thus, the actual task of collecting and disposing of municipal wastes remains a problem squarely faced for the most part only by local governments.

Attempts to cope with mounting volumes of waste have triggered an intensive search for new collection and disposal techniques, as well as new ways to regulate and cut down potential waste. The problem is compounded by rising costs of land, as well as by pollution problems linked to traditional "open dumping." Sanitary landfills avoid the latter problem, but they are more expensive than dumps, and land is hard to find in highly populated urban areas. Incineration, used in the disposal of only 8 percent of municipal solid waste, causes air pollution problems without proper controls, illustrating the interrelationships of environmental problems.

As efforts to meet these problems intensify, two significant trends in local waste management are emerging. First, the [illegible] of waste collection increasingly is being handed over to the private sector. Municipal franchises designed to make trash collection a profitable private venture are becoming common, reducing the financial burden on local governments. Second, as nearby sites for land disposal of waste become scarcer, localities are beginning to look to potential sites in other political jurisdictions. This often raises difficult social and legal problems that cause costly delays. These problems lend increasing impetus toward development of regional and multijurisdictional programs for waste management. Thus, the move to more widely based programs in solid waste management may soon begin to parallel some of the strategies now common to air and water pollution control.

Localities are also looking more and more at ways to reduce the amount of solids that actually end up as wastes. Container laws, tax and deposit requirements, and recycling programs all aim at curbing the volume of waste ultimately requiring disposal.

Recycling offers a number of significant environmental advantages over traditional disposal techniques. However, there are indications that the economics of recycling is not now favorable as contrasted with the disposal alternatives. As a consequence, local recycling efforts have been limited and sporadic, and large-scale recycling systems have not gained widespread acceptance.

As the preceding discussion indicates, one result of the increased concern in recent years for maintaining and enhancing the quality of the environment has been to place new emphasis on Federal and State programs. These levels of government are often better able to deal with problems of pollution affecting areas beyond the control of any single locality. At the same time, however, local jurisdictions continue to play a major role in many antipollution activities, ranging from enforcement of air quality standards to maintenance of adequate sewage treatment facilities and solid waste control programs. It is also clear that local jurisdictions will continue to face many new challenges in meshing traditional responsibilities with wider Federal and State roles. These challenges will test the ability of local governments as well as our Federal system to respond to new demands and changing areas of concern. But there is every reason to believe that the basic adaptability of our institutions and the closeness of local governments to immediate environmental problems will cause local jurisdictions to continue to play a major and positive role. The remainder of this chapter illustrates in greater depth the nature of this role in one particular area—that of controlling noise pollution.

noise

The impact of noise falls most heavily on the average city dweller. The typical urban resident is exposed to noise of varying intensity and duration through much of his working day, weekends, and nights. He may begin his day awakening to the clamor of morning traffic. At work, construction and traffic noise may buffet him from the outside while typewriters and other office machinery clatter from within. If he works in a factory or at a construction site or drives a truck, noise levels may be extremely high. Even at home, the typical urban resident may be exposed to many of these sources and to others, including household appliances, air conditioners, lawn mowers, power tools, and neighbors. Noise from some of these sources may recur or continue throughout the night. Even leisure time away from the urban hubbub may be filled with noise from campers, powerboats, dune buggies, or snowmobiles. It is increasingly difficult for any individual—in urban or rural America—to escape noise.

For many city residents, noise may be the single most pervasive environmental pollutant. In some instances, of course, noise serves a useful purpose (e.g., from an alarm clock or an emergency vehicle), but only to those whom it is intended to serve. In most instances, however, noise is a useless and sometimes harmful byproduct which municipal governments, since the days of Caesar's Rome, have tried to abate.

history of municipal action

Until recent years, local jurisdictions have exercised almost exclusive responsibility for noise control. Characteristic of an early attempt by a city government to control noise was a 1929 ordinance in Pontiac, Mich. It defined as a nuisance the operation "of noisemaking, noise amplifying or noise producing instruments or devices by which the people or good order of the neighborhood is disturbed." [19]

The first systematic and detailed study of urban noise was made in 1930 by New York City's Noise Abatement Commission, appointed by the City's Commissioner of Health. Entitled "City Noise," the study was based on a survey of the impact of noise on thousands of New Yorkers. It measured noise levels in different parts of the City, investigated their effect on human beings, and analyzed the characteristics of a number of separate noise sources and means of reducing their impact.[20] The report, which was widely read and accepted, concluded that "noise as it prevails in our city today is definitely detrimental to the well-being and efficiency of those who live and work here."

The report led to steps to curb noise in New York City. Noiseless turnstiles were introduced in the subways and rubber-tired handcarts in the garment district. An existing ordinance was invoked against unnecessary steamboat whistles. New ordinances were adopted to control radio loudspeakers and automobile horns. Mufflers or silencers were required on engines.

In the years following the Noise Abatement Commission's report, many cities throughout the United States adopted ordinances regulating noise. In 1937, Miami Beach, Fla., banned sources of noise found to be excessive or to disturb the peace and quiet of the neighborhood;[21] Madison, Wis., had adopted a similar ordinance in 1935;[22] Richmond, Va.,[23] and Memphis, Tenn.,[24] both followed suit in 1938.

In 1948, the U.S. Supreme Court dealt a blow to noise control efforts when it declared a Lockport, N.Y., ordinance unconstitutional. The ordinance outlawed the use of a sound truck without a permit from the Chief of Police. The Court found that because no standards were prescribed for the exercise of the Chief's discretion, the ordinance restrained the right of free speech in violation of the First Amendment.[25]

In the wake of this decision, new ordinances were enacted setting permit standards, as in Buffalo, N.Y.[26] New Rochelle, N.Y., regulated sound trucks themselves—their hours of operation, effective distances, acoustic power, and the like.[27] Also in 1948, the National Institute of Municipal Law Officers (NIMLO) issued a report that became a guide for unnecessary noise ordinances and control of sound trucks.[28]

By the 1960's, some municipalities were adopting ordinances which set numerical limits on the amount of noise permitted from various sources. A model ordinance of this type was proposed and published by NIMLO in 1970.[29] It provided for the adoption of quantitative standards to limit noise.

types of municipal regulations

Most municipal noise control ordinances fall into one of two categories. The first is a subjective type of ordinance that prohibits noise deemed excessively or unreasonably loud. The second and more recent type of ordinance prohibits noise that exceeds a specific numerical level, usually stated in decibels (dBA).[30] (Noise measurement and effects are discussed in footnote 30.) These two types of ordinances represent, basically, the differences between a qualitative and quantitative approach to noise abatement. Some cities, such as New York City, have adopted features of both approaches.

The more general, qualitative noise ordinance has been adopted in the majority of local jurisdictions, among them Washington, D.C., Boston, Mass., and Memphis, Tenn.[31] Of 51 municipal government codes recently examined by NIMLO, 32 had this type of ordinance. A study recently conducted for the Environmental Protection Agency, covering some of the same jurisdictions, reported that 46 of 83 fit this category.[32]

In the past, legal attacks on such ordinances have alleged that they are unconstitutionally vague and violate the due process guarantees in Federal or State constitutions. Such attacks generally have not succeeded, however, because the courts have held that the words of the ordinance in question are to be given an ordinary and common sense meaning in their interpretation.

Quantitative ordinances are a comparatively recent development, setting a definite numerical standard to separate illegal and legal noise. A number of municipal governments have recently enacted such ordinances, among them Chicago and Urbana, Ill. (1971), Minneapolis, Minn. (1971), and the California cities of El Segundo (1971), Torrance (1971), Alhambra (1971), Inglewood (1970), and Beverly Hills (1970).[33]

Chicago has probably the most comprehensive noise control ordinance in the Nation.[34] The scope of its new ordinance is indicated by the noise sources covered, which include hand organs, steam whistles, noise from buildings and building operations. Other regulations cover noise from bells and sirens on bicycles, horns and mufflers, boat whistles, and locomotive signals. Power driven vehicles and equipment covered by the new ordinance include automobiles, trucks, motorcycles, powerboats, lawnmowers, dune buggies, go-carts, and snowmobiles.

The Noise Control Code proposed in 1971 by New York City would combine features of both the qualitative and numerical approaches to noise control. The Code, which is currently scheduled for adoption by the City Council in the summer of 1972, will retain and codify all of New York's existing "unnecessary noise" statutes, embracing court precedents already established. The proposed Code will set specific numerical limits on the use of such sound sources as motor vehicles, air compressors, jackhammers, and garbage trucks. Furthermore, the proposed New York City Code will establish within 2 years of adoption ambient noise standards (ambient noise is the total of all noise normally present at a given time and location) for various zones of the city depending on the land uses of reach zone.[35] All violations under the proposed code will be handled by a special administrative tribunal rather than the criminal courts.

enforcement

Noise ordinances have typically been difficult to enforce. The subjective type of ordinance has been enforced most frequently only following citizen complaints. In the absence of citizen complaints, local law enforcement officials often are unaware or unmindful of noise regulation ordinances.[36] Even when complaints have been made, one or more "warnings" are usually issued to a violator first.

Quantitative ordinances usually fare little better, although for somewhat different reasons. Their enforcement requires specialized equipment and trained personnel. Technical problems arise in separating sounds from potential violators and background noise. Measuring frequency, distance, and duration of sound is likewise difficult.[37] These technical difficulties can act as a disincentive to effective enforcement. For example, where numerical ordinances are enforced by municipal police, the complexity of the measuring equipment coupled with its infrequent use often make the individual patrolman wary of his ability to employ the equipment competently.[38] Some municipalities provide training for local officials responsible for enforcing noise standards. The proposed Noise Control Act now pending before the Congress would authorize the Environmental Protection Agency to provide technical assistance to State and local governments (see Chapter 4 of this report on Federal activities for a discussion of this proposed law). This will include advice on ambient noise standards, training of personnel, and techniques for noise measurement and control.

Another significant defect in enforcement of either type of ordinance is the absence, in many instances, of aggressive noise control programs. Personnel and funding generally are quite limited at the local level no matter how good the ordinance.[39] (See Table 1 for levels of funding by selected local governments.) Moreover, communities face a dilemma when part of their noise control efforts are aimed either directly or indirectly at the regulation of industrial noise sources. Such sources usually constitute a relatively minor portion of the overall local noise level, but they may account for a significant segment of the tax base.

One problem in the past has been a common public acceptance of noise as an inevitable concomitant of urban life. Only recently has there been a broadening public recognition that much of the noise we have tolerated is unnecessary.

Where municipalities have vigorously enforced noise abatement ordinances, results have been noticeable. Memphis, Tenn., for example, which has the reputation of being a quiet city, has enforced its broad ordinance prohibiting unnecessary noise, giving particular attention to unnecessary horn blowing.[40]

organization

Municipalities generally have turned to one of two administrative arrangements to curb noise.[41] Some jurisdictions, such as Chicago and New York City, respectively, have adopted or proposed a comprehensive noise ordinance and invested a local environmental protection agency with the powers to administer and enforce it. Such an approach centers the responsibility for both promulgating and enforcing regulations in one agency to provide a more efficient and streamlined program. Noise control experts generally favor separating the specialized enforcement of noise abatement from the usual duties of the police force.[42]

Most municipalities, however, incorporate noise controls into existing regulations, then split enforcement among various municipal agencies. Those elements of noise control affected by land use planning, for example, would fall to the local zoning authority. Responsibility for transportation noise control would go to traffic authorities. Decentralization allows a city to tap a range of expertise and to spread the added cost and manpower burden among a number of agencies. But it often frustrates any comprehensive approach to the problems of noise control because of the difficulty of interagency coordination. Moreover, few, if any, of the responsible agencies view noise control as a principal—or even an important—mission.

Table 1

Municipal Noise Abatement Expenditures

[In thousands of dollars]

	1970	1971	1972
New York, N.Y.*	$55	$150	$200
Chicago, Ill.*	40	93	163
Las Vegas, Nev.	....	....	50
Philadelphia, Pa.	14	26	27
Boston, Mass.	25	25	38
Atlanta, Ga.	....	25	25
Honolulu, Hawaii	....	5	10
Dallas, Tex.*	1	3	6
New Orleans, La.	....	4	4
Fremont, Calif.	2	2	3
Columbia, S.C.	1	2	2
Minneapolis, Minn.	2	2	2

Source: Unless otherwise indicated, all data are taken from EPA, "State and Municipal Nonoccupational Noise Programs," Dec. 31, 1971, App. B. The asterisk indicates that the data are CEQ.

federal and state activities

Although local governments historically have wielded authority over noise control, there is a mounting awareness of the need to set national standards on products sold in interstate commerce. The pending Noise Control Act of 1972, passed by the U.S. House of Representative in February 1972, would bar State and local governments from applying any but Federal noise standards to products covered by Federal law.[13] However, the bill would not stop State or local governments from passing ordinances to control ambient noise by regulating the use, operation, or movement or any vehicle or equipment.

Under the proposed law, when the Federal Government, for example, sets standards for new cars, State or local governments may not then set different noise emission standards. Hence, automobiles sold in interstate commerce would not have to meet a myriad of different State and local laws. State and local governments could, however, control noise from vehicles with ordinances restricting vehicles in use, for instance, through ambient noise limits for specific zones or during specific times. If the local ambient noise limit is more stringent for a given speed and measurement distance than the Federal emission limit, the local ordinance may require the vehicle to travel at a lower speed. Or it may bar vehicles from certain areas or outlaw their use during the times to which the local limits apply.

Except for the control of auto exhaust noise, there has been relatively little State activity in noise regulation until recent years. Florida[44] and New Jersey,[45] among others (see Chapter 5 of this report), have adopted noise abatement legislation in the past few years. The New Jersey law, enacted in 1971, permits municipal regulation of noise at levels more stringent than State regulations, subject to the approval of the State agency. The Florida legislature left intact previously enacted local controls and allowed new local controls at least as stringent as the State regulations.

In other cases, local governments are limited by State regulation in their power to control noise. Hawaii, for example, adopted a noise control law in 1970 that entirely forbids separate local noise legislation.[46]

sources of noise regulated

Municipal noise control efforts focus principally on noise from the following broad areas: airplanes and airports, vehicles, construction, industrial and commercial activities, household appliances, and internal building noise.

aircraft and airport noise—Federal law grants extensive authority to the Federal Aviation Administration to control the use of aircraft and airspace and to regulate air traffic. Municipalities are therefore able to exercise only limited control over aircraft noise, clearly one of the most controversial of all noise sources. Attempts by local jurisdictions to curb aircraft noise by regulating the operation of aircraft have been struck down by the courts when the ordinance was found to create an unconstitutional burden on interstate commerce. They have met the same fate in the face of either an explicit or implied preemption of local action by Federal legislation or when the local ordinance clashes directly with a Federal regulation.[47] Although yet to be affirmed by court action, local ordinances regulating some aspects of airport operations presumably would be permitted when they do not imperil aircraft operation safety or unreasonably burden interstate commerce. For example, cities might order aircraft engine maintenance activities relocated or shielded when they generate noise levels at the airport boundary higher than those permitted by State or local law. In any event, local governments may wield their land planning and zoning powers to lay out industrial parks and other nonresidential uses to serve as noise buffer zones around airports.

Airport owners, on the other hand, can exercise direct control over some aspects of airport noise.[48] They can establish nondiscriminatory restrictions on the permissible noise level of aircraft using the airport. They can specify the location for engine runup procedures. Such measures, which because of Federal law are normally beyond what a municipality may legally do, can be employed by local governments that are owners of airports.

Major airport sites are often selected by specially created authorities with varying degrees of accountability to State and local governments and to the communities where the airport is to be located. Where Federal funds are involved in the development or improvement of an airport, Federal law offers some opportunity for affected local governments to participate in decisionmaking. The National Environmental Policy Act gives local government units an opening to comment on Federal and federally supported projects that will significantly affect the quality of the environment.[49] The Airport and Airway Development Act of 1970 also requires greater citizen and, in some cases, local government participation in airport location and expansion projects prior to Federal funding.[50] At a minimum, public hearings must be held to consider the "economic, social and environmental effects of the airport location and its consistency with the goals and objectives of such urban planning as has been carried out by the community." When a proposed new airport does not serve a metropolitan area, the Department of Transportation must consider the views of affected communities around the site prior to granting approval.[51]

Three-fifths of the 127 final environmental impact statements on airport construction and development issued by Federal agencies in the 12 months preceding June 1972 carried comments by a municipal government unit. Under the Airport and Airway Development Act, however, communities have requested hearings in only 29 percent of the cases where such hearings are possible.[52]

vehicle noise—Local governments probably regulate motor vehicles more than any other noise source.[53] The majority of local governments have adopted noise ordinances of a general, descriptive nature. They either require adequate muffler devices on motor vehicles or prohibit unnecessary noise. Some localities have set quantitative noise emission limits for various types of vehicles and others have combined both approaches.

Perhaps the most common legal devices used to control vehicular noise at both the State and local level are ordinances covering horn blowing and mufflers. Of 83 municipal ordinances examined by an EPA contract study, 51 restricted horn noise and 33 required mufflers.[54] Decatur, Ill., and Madison, Wis., for example, both have horn-blowing ordinances. Philadelphia and Des Moines have muffler requirements. Twelve municipalities have enacted ordinances to control all noise emitted by automobiles.[55] Salt Lake City, for example, prohibits unreasonable and unnecessary noise and forbids excessive and unusual noise from vehicles in quiet zones.[56] Beverly Hills, Calif., prohibits repair or testing of vehicles in residential areas if it annoys or discomforts residents.[57] Five cities in the EPA study, including Ann Arbor, Mich., Pocatello, Idaho, and Cincinnati, Ohio, have enacted vehicle noise laws which set quantitative limits on noise emissions. Chicago and Minneapolis have adopted perhaps the most extensive vehicular noise control laws of major U.S. cities. They restrict even the sale of automobiles which exceed specified noise emission limits.

The Chicago ordinance, discussed earlier, provides that no automobile may emit noise in excess of 76 dBA (measured at a distance of 50 feet) when traveling at speeds up to 35 m.p.h. nor more than 82 dBA at speeds over 35 m.p.h. The ordinance reduces these limits after January 1, 1978, to 70 dBA and 79 dBA for vehicle speeds below and above 35 m.p.h., respectively. In a separate provision aimed at new vehicles, the Chicago law orders that vehicles manufactured after January 1, 1973, cannot be sold in Chicago if they make noise in excess of 84 dBA measured at 50 feet. This limit drops to 80 dBA and then 75 dBA for vehicles manufactured after January 1, 1975, and January 1, 1980, respectively. Noise emission limits for sale of construction equipment and powered hand tools will be set at 80 dBA by 1980, motorcycles at 75 dBA by 1980, and lawn mowers at 65 dBA by 1978.

Some of the foregoing provisions would be preempted by Federal noise emission standards under the noise control legislation pending in the Congress.

Motorcycles are usually subject to the same statutes as automobiles. Some cities, however, such as Missoula, Mont., Detroit, Chicago, and Minneapolis, have adopted ordinances specifically to control motorcycle noise either by muffler regulations or by setting quantitative limits on noise emission.[58] For example, until January 1, 1978, Chicago prohibits motorcycle noise in excess of 82 dBA at speeds up to 35 m.p.h., and 86 dBA at speeds over 35 m.p.h. (measured at 50 feet). After January 1, 1978, the limits drop to 78 dBA and 82 dBA at speeds below and above 35 m.p.h., respectively. Furthermore, as with other motor vehicles, Chicago prohibits the sale of motorcycles that are noisier than specified limits, which become increasingly stringent with later dates of manufacture.

construction noise—Both curfew and quantitative ordinances are used to curb noise at construction sites, with the more traditional curfew ordinance found in the majority of local jurisdictions. Such an ordinance typically prohibits construction or the use of certain equipment—such as pneumatic drills and pile drivers—during specified time periods.[59] For example, Portland, Oreg.,[60] prohibits noise-producing construction activities from 6 p.m. to 7 a.m. Toledo, Ohio,[61] bars such activities from 9 p.m. to 6 a.m. Such curfew ordinances, however, usually allow exceptions for emergency situations,[62] public utilities work,[63] construction in the public interest,[64] or construction in nonresidential districts [65] and in other instances when there is no harm to public health or safety.[66] Unless strictly construed, such exemptions can of course overshadow the basic prohibition.

Numerical ordinances are a more recent phenomenon in the area of construction noise abatement. The Minneapolis noise ordinance, for example, prohibits operation of construction equipment that generates noise in excess of 100 dBA at the property line. This limit will drop to 95 dBA in September 1973 and to 90 dBA in September

1975.[67] The Chicago ordinance combines features of both a curfew and a quantitative approach. It prohibits use of construction equipment between 9:30 p.m. and 8 a.m. within 600 feet of a hospital or residence and sets permissible noise levels for equipment that is sold, based on the date of manufacture.[68]

Noise emission limits applicable to new construction equipment alone (as well as vehicles and other noise sources) suffer from two limitations. Because existing machinery is not regulated, lower noise levels are achieved only as older equipment is phased out. Also, where local ordinances rely only on controlling the noise output of individual pieces of equipment, total noise from a construction site could still reach unacceptable levels if too many machines operate at once. New York City's pending noise code would minimize these limitations by setting numerical ambient noise standards for different areas.[69] Likewise, Chicago has set numerical limits on the amount of noise permitted in different regions of the city. This approach may require the use of quieter equipment or require adequate shielding of the site in order to comply with the ambient noise limits.

industrial and commercial noise—Many local jurisdictions use a variation of the traditional "unnecessary noise" type of ordinance to regulate commercial and industrial noise. The ordinances generally prohibit blowing steamwhistles except at the beginning and end of the working day and to signal emergencies.[70] They prohibit excessively loud machinery[71] and regulate outdoor loudspeakers through detailed application and licensing procedures.[72] Community noise from businesses and industrial machinery generally is defined as excessive only if it offends people residing nearby.[73] On the business site, noise levels are controlled through Federal and State occupational health and safety laws designed to protect employees, although these laws typically permit use of hearing protection devices as an alternative to abating the noise itself.

Some recent attempts by local governments to control industrial and commercial noise sources have used both quantitative noise limits and previously established land use zoning boundaries,[74] with maximum permissible noise levels established for each zone. Such an ordinance may take into account the type and duration of noise, the time of day, day of the week, and ambient noise levels. Chicago's ordinance is of this type.[75]

residential noise—The growing public awareness of noise has triggered a rapid expansion in the number of complaints filed with local environmental protection agencies. Many of these complaints relate to noise from such domestic sources as air conditioners, power lawnmowers, and television sets.[76]

Both the subjective and numerical noise ordinances enacted by many local governments regulate power tools, air conditioners, and other mechanical equipment used for noncommercial purposes.

Memphis, Tenn., for example, prohibits playing radios, phonographs, and other devices when they "annoy or disturb the quiet, comfort, or repose of persons" in or near the vicinity.[77] White Plains, N.Y., has a similar ordinance specifically prohibiting the use of fans, air conditioners, lawnmowers and chain saws when they disrupt the peace of the community.[78]

Quantitative ordinances may regulate the same types of noise sources. They either rely upon ambient noise levels to serve as a baseline or set absolute numerical limits. For example, Alhambra, Calif., prohibits noise between the hours of 10 p.m. and 7 a.m. from machinery, equipment, fans, and air conditioners which is more than 5 dBA above the ambient noise level.[79] Its ordinance also covers radios, phonographs, and other sound reproduction equipment. Because such ordinances are based on the ambient noise level, this must be determined before a violation can be established. This requirement can complicate enforcement of the law. Moreover, a slow rise in ambient noise levels is possible.

Torrance, Calif., on the other hand, has set upper limits on the amount of noise permitted. Certain residential areas, for example, may not be exposed to steady noise levels in excess of 50 dBA between the hours of 7 p.m. and 10 a.m. or in excess of 55 dBA at other times.[80]

None of the four model building codes[81] used by many municipalities to regulate construction of multifamily structures specifically curbs noise that travels through walls to other apartments or adjoining dwellings. If the codes help to reduce noise it is only incidental to their main functions of assuring structural soundness and minimizing fire hazards. One model code, however, has an optional appendix recommending minimum sound transmission characteristics.[82] And some municipalities that have adopted one of the model building codes have amended it to require soundproofing.[83]

Local ordinances regulating interior building noise are primarily limited to new construction. New construction now will also be influenced by specific requirements recently set by the Department of Housing and Urban Development (HUD) governing approval of projects under all HUD programs, including those of the Federal Housing Administration.[84] These requirements are aimed at discouraging certain types of construction (e.g., homes, hospitals, dormitories) in noisy areas by withholding Federal support.

summary

Efforts by local governments to curb noise cover a wide spectrum. Ordinances vary from traditional, general attempts to control unreasonable noise to more sophisticated quantitative limitations. The comprehensiveness of such legislation ranges from control of only traditional noise sources, such as sound trucks, to curbing some aspects of jet aircraft noise.

Local government control over airport and aircraft noise is strongly circumscribed by Federal law, but it is most effectively exercised where the local government is owner of the airport. The control of noise from vehicles is evolving from nonquantitative muffler and horn-blowing regulations to the adoption of numerical limits on noise emission. The use of curfew ordinances to regulate noise from construction sites is being supplemented by laws controlling ambient noise and noise emitted by construction equipment. Noise from industrial and commercial operations is being controlled through a mixture of "unnecessary noise" ordinances, land use controls, and more recently, quantitative limitations. While abatement of noise in homes and residential areas has focused largely on a variety of specific noise sources, recent efforts aim to control noise through setting ambient noise limits and discouraging the siting of new residences in noisy areas.

Pending Federal legislation would elevate certain areas of noise regulation to the national level. At the same time, the Federal technical assistance provided for in this legislation should help local governments conduct more effective noise control programs in consonance with the expanded Federal program.

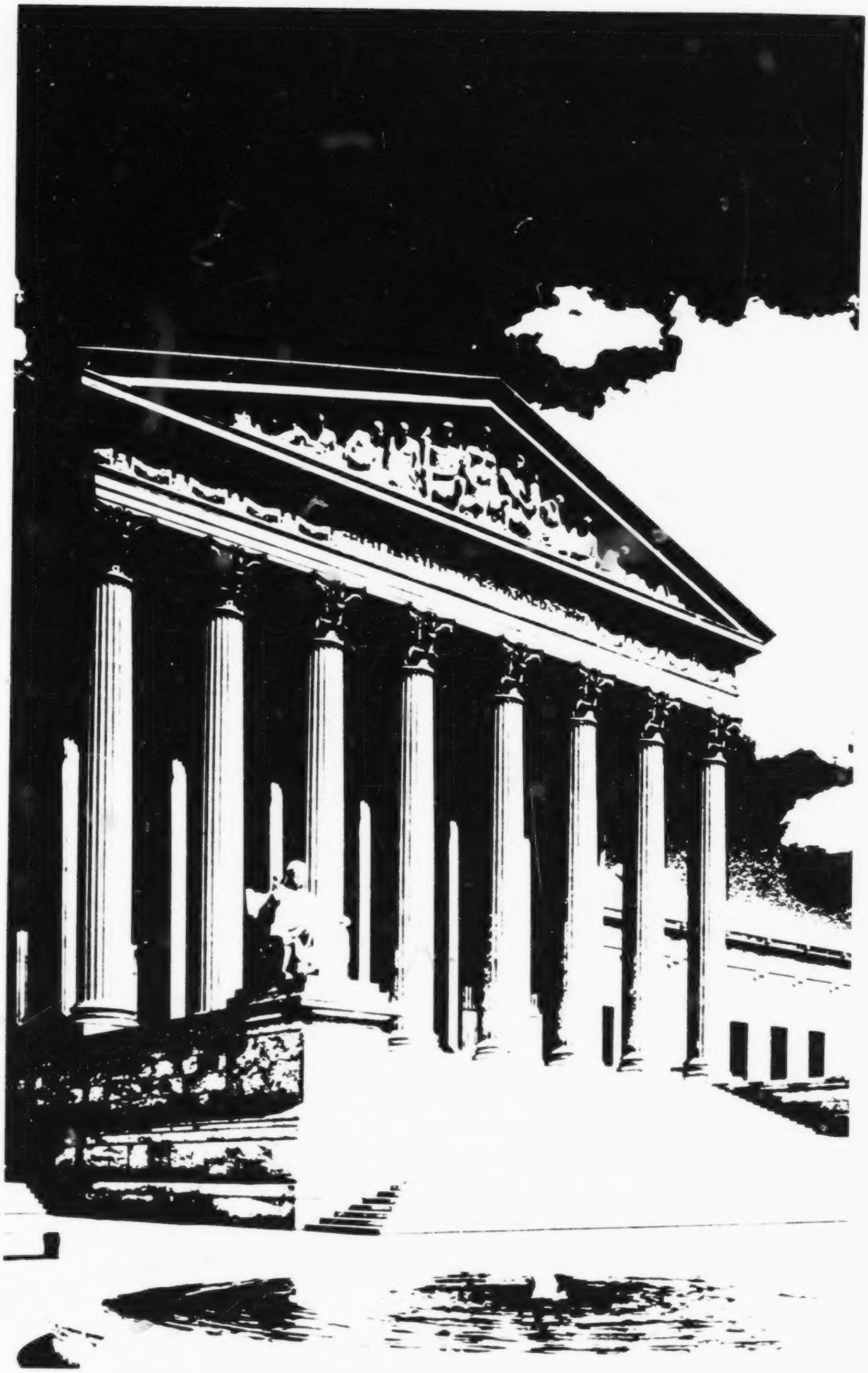
footnotes

1. Environmental Protection Agency (EPA), *Report to the President and Congress on Noise,* December 31, 1971, N.R.C. 500.1. See also the extensive discussion of local noise control regulations contained in EPA, *Laws and Regulatory Schemes for Noise Abatement,* a contract study by George Washington University, NTID 300.4, December 31, 1971.
2. Council on Environmental Quality, *Local Government Control of Noise Pollution,* a contract study by the National Institute of Municipal Law Officers (NIMLO), April 4, 1972.
3. Council on Environmental Quality, *Environmental Quality: First Annual Report,* p. 61 (1970).
4. Act of 1911, P.L. 667, § 1; *Purdon's Pa. Stat. Ann.*, title 53, § 9691 (1938) [enacted after two Pittsburgh ordinances were invalidated by State courts (German, "Regulation of Smoke and Air Pollution in Pennsylvania," 10 *U. Pitt. L. Rev.* 493, 495 (1949))]; see also Cal. Health & Safety Code §§ 24198–24302.
5. E.g., New Jersey P.L. 1954, ch. 212, as amended, now N.J.S.A. 26: 2C–1 et seq.
6. *Cf.* J. C. Davies, III, *The Politics of Pollution*, p. 51 (1970).
7. Clean Air Act of 1963 (P.L. 88–206).
8. Motor Vehicle Air Pollution Control Act (P.L. 89–272).
9. Air Quality Act of 1967 (P.L. 90–148).
10. Clean Air Amendments of 1970 (P.L. 91–604).
11. See H. Ballman and T. Fitzmorris, *Local Air Pollution Control Programs—A Survey and Analysis*, p. 292; Special Subcommittee on Air and Water Pollution, U.S. Senate, *A Study of Pollution—Air*, p. 402 (staff study), Hearings before Special Subcommittee on Air and Water Pollution, U.S. Senate, 88th Cong., 1st Sess., Sept. 1963.
12. *Air/Water Pollution Report,* April 10, 1972, p. 147.
13. F. P. Grad, *Environmental Law*, § 2–44 (1971).
14. Water Pollution Control Act (P.L. 80–845).
15. *Environmental Quality: First Annual Report, supra,* note 3 at 46.
16. Solid Waste Disposal Act (P.L. 89–272).
17. Resource Recovery Act of 1970 (P.L. 91–512).
18. See the discussion of State actions in chapter 5 of this report.
19. Pontiac, Michigan, Ordinance No. 809 (June 4, 1929).

20. Noise Abatement Commission, *City Noise* (Dept. of Health, City of New York, 1930).
21. Miami Beach, Florida, Ordinance No. 497 (Oct. 6, 1937).
22. Madison, Wisconsin, Code § 24.09 (Aug. 10, 1935).
23. Richmond, Virginia, Ordinance (Jan. 14, 1938).
24. Memphis, Tennessee, Ordinance (May 24, 1938).
25. *Saia* v. *New York,* 334 U.S. 558 (1948).
26. Buffalo, New York, Code § 216 (Dec. 14, 1948).
27. New Rochelle, New York, Code § 224 (May 16, 1949).
28. C. Rhyne, *Municipal Control of Noise—Sound Trucks—Sound Advertising Aircraft—Unnecessary Noises—Model Annotated Ordinances* (NIMLO Research Report No. 123, 1948).
29. S. Levin, A. Gordon, C. Hartelius, *Law and the Municipal Ecology,* 77–85 (NIMLO Research Report No. 156, 1970).
30. Decibels are a measure of the sound pressure level. When measured in decibels on the "A" scale of a standard sound level meter—(a noise scale which approximates the frequency response of the human ear and whose units are abbreviated "dBA")—the response of the human ear ranges from 0 dBA, the threshold of hearing, to about 120 dBA which is at the threshold of pain. Between these values, typical sound levels produced by various sources are: 30 dBA, a soft whisper heard from 15 feet away; 55 dBA, light auto traffic heard from 50 feet away; 75 dBA, freeway traffic heard from 50 feet away; 85 dBA, a pneumatic drill heard from 50 feet away; and 105 dBA, an auto horn heard from 3 feet away (see Note 3, *supra,* CEQ: *Environmental Quality: First Annual Report*). The sound level of ordinary conversation is about 65 dBA, and extended exposure to levels in excess of 80–85 dBA is generally considered to cause permanent hearing loss. (Environmental Protection Agency: *Effects of Noise on People,* a contract study by the Central Institute for the Deaf, NTID 300.7, December 31, 1971.) The "loudness" of a sound approximately doubles with every 10 decibel increase, loudness being defined as the apparent subjective magnitude of a sound as perceived by a human listener.
31. Washington, D.C., traffic and motor vehicle ordinances, police regulations, and zoning ordinances; Boston, Massachusetts, Revised City Ordinances; Memphis, Tennessee § 24–5 (Sept. 12, 1967).
32. *Report to the President and Congress on Noise, supra,* note 1, at 4–14.
33. Chicago, Ill., Code § 17–4 (April 6, 1971); Urbana, Ill., Ordinance to Control Noise and Vibrations Within the City Limits of Urbana, Ill. (Nov. 15, 1971); Minneapolis, Minn., Code of Ordinances, ch. 246 (Eff. Oct. 1, 1971); El Segundo, Calif., Code § 9.04.030 (Dec. 27, 1971); Torrance, Calif., Code § 46, (March 30, 1971); Alhambra, Calif., Code § 18.04 (May 15, 1971); Inglewood, Calif., Code § 4600 (Nov. 6, 1970); Beverly Hills, Calif., Code § 4–8 (Eff. Feb. 4, 1971).
34. *Laws and Regulatory Schemes for Noise Abatement, supra,* note 1 at 1–134.
35. New York City Environmental Protection Administration, *A Guide to the New York City Noise Control Code,* pp. 6, 7.
36. C. Bragdon, *The Community Noise Problem: Factors Affecting Its Management,* 10 Nat. Res. J. 687, 701 (Oct. 1970).
37. For a general discussion of the enforcement problems related to quantitative ordinances see *Law and the Municipal Ecology, supra,* note 29 at 75–76. *See also* T. O'Connor, City Attorney of San Francisco, City Attorney's Opinion No. 71–45, June 10, 1971.
38. C. Bragdon, in *The Community Noise Problem, supra,* note 36 at 704.
39. *Report to the President and Congress on Noise, supra,* note 1 at 4–48.
40. *Laws and Regulatory Schemes for Noise Abatement, supra,* note 1 at 3–38.
41. C. Bragdon, in *The Community Noise Problem, supra,* note 36 at 704.

42. *Laws and Regulatory Schemes for Noise Abatement*, *supra*, note 1 at 1–102 and 3–48.
43. H.R. 11021, 92d Cong., 2d Sess. § 2 (a)(3) (1972).
44. Ch. 71–36 (1971) amending Fla. Stat. §§ 403.031 and 403.061.
45. N.J.S.A. § 13:1G–1 to 13:1G–23 (1971).
46. Act 147, § 322(b) (1970) amending Hawaii Rev. Stat., ch. 322.
47. *Lockheed Air Terminal Inc.* v. *City of Burbank*, 457 F. 2d 667, 3 ERC 1983 (9th Cir. 1972), *Allegheny Airlines* v. *Village of Cedarhurst*, 238 F. 2d 812 (2d Cir. 1956), *American Airlines, Inc.* v. *Town of Hempstead*, 398 F. 2d 369 (2d Cir. 1968).
48. *Port of New York Authority* v. *Eastern Airlines, Inc.*, 259 F. Supp. 745 (E.D.N.Y. 1966).
49. 42 U.S.C. § 4332.
50. 49 U.S.C. §§ 1701–1727, 84 Stat. 219.
51. 49 U.S.C. § 1716(f).
52. *Report to the President and Congress on Noise*, *supra*, note 1 at 4–37.
53. *Laws and Regulatory Schemes for Noise Abatement*, *supra*, note 1 at 1–108.
54. *Laws and Regulatory Schemes for Noise Abatement*, *supra*, note 1 at 1–112, 1–175.
55. *Laws and Regulatory Schemes for Noise Abatement*, *supra*, note 1 at 1–109.
56. Salt Lake City, Utah, Revised Ordinances art. 9, § 247.
57. Beverly Hills, Calif., Municipal Code § 4–8.401 (1970).
58. Missoula, Mont., City Ordinances § 20–14.1; Detroit, Mich., City Code §§ 38–6–20 to 38–6–26 (1969); Chicago, Ill. (1971); and Minneapolis, Minn. (1971), *supra*, note 33.
59. See, e.g., Burbank, Calif., Code § 21–12(c) (March 20, 1972); Chattanooga, Tenn., Code § 25–34(h) (June 18, 1968); Sacramento, Calif., Code § 26.29(e).
60. Portland, Ore., Code § 14.52.–2–(4) (April 4, 1970).
61. Toledo, Ohio, Code § 17–18–3(d) (1968).
62. Alhambra, Calif., Code § 18.04 (1971); El Segundo, Calif., Code § 9.06 (1971).
63. Chicago, Ill., Code § 17–4.6 (1971).
64. Chattanooga, Tenn., Code § 25–34 (1968).
65. Beverly Hills, Calif., Code § 4–8 (1970); Burbank, Calif., *supra*, note 59 (1970); Urbana, Ill., Ordinance (1971) *supra*, note 33.
66. See, e.g., Alhambra, *supra*, note 33 (1971); El Segundo, *supra*, note 33 (1971); Greensboro, N.C., Code § 13–12 (1971).
67. Minneapolis, Minn., *supra*, note 33 (1971).
68. Chicago, Ill., *supra*, note 33 (1971).
69. *A Guide to the New York City Noise Control Code*, *supra*, note 35.
70. See, e.g., Norfolk, Va., Code § 31–48(e) (1969); Baton Rouge, La., Code § 102(8) (1954); Greensboro, N.C., Code § 13–12(5) (1971).
71. See, e.,g., White Plains, N.Y., Ordinance § 4(g) (June 19, 1967, amended May 7, 1970).
72. Greensboro, N.C., Code § 13–12(b) (14) (1971); Monterey, Calif., Code § 22–17 (1971).
73. White Plains, N.Y., *supra*, note 71.
74. Urbana, Ill., Ordinance §§ 7–13 (1971); El Segundo, Calif., Code § 9.06.040, and § 9.06.110 (1971); Burbank, Calif., Codes § 21–11 (1972).
75. Chicago, Ill., *supra*, note 33.
76. Statement of Robert D. Cusumano (Transcript of Noise Control Hearing (Washington, D.C.) p. 650, November 12, 1971, held by EPA, Office of Noise Abatement and Control).
77. Memphis, Tenn., *supra*, note 31.
78. White Plains, N.Y., *supra*, note 71.

79. Alhambra, Calif., Code § 18.08.060 and 18.08.010 (1971). Subsection (b) of this ordinance defines ambient noise level in terms of zoning and time.
80. Torrance, Calif., *supra,* note 33.
81. International Conference of Building Officials (ICBO), *Uniform Building Code* (1970, supp. 1971); Building Officials & Code Administrators International, Inc. (BOCA), *The BOCA Basic Building Code/1970,* 5th Ed. (1970); American Insurance Association, *National Building Code* (1967); Southern Building Code Congress, *Southern Standard Building Code* (1969, supp. 1971).
82. Southern Standard Building Code, *supra,* note 81, Appendix "E."
83. El Segundo, Calif., Code § 16.04.110 (1972).
84. U.S. Department of Housing & Urban Development, Circular 1390.2 (1971).



7

nepa — reform in government decisionmaking

the origins of nepa

nepa's enactment

On February 17, 1969, a bill was introduced in the United States House of Representatives "to provide for the establishment of a Council on Environmental Quality." [1] The following day, a measure with similar intent was introduced in the Senate.[2] In the next 11 months the two bills received Congressional consideration, with bipartisan sponsorship and support, were combined in conference, and were amended to proclaim their primary purpose: "to establish a national policy for the environment." [3] The National Environmental Policy Act (NEPA) [4] was signed into law by the President on January 1, 1970. It has become the basic policy-setting Federal law relating to protection of the environment.

Earlier proposals had laid a foundation for this action. A number of related bills had been introduced in earlier Congresses but had died in committee.[5] As early as 1965, Russell Train, then head of the Conservation Foundation, proposed "that the President establish a Council of Ecological Advisers" to give environmental concerns "an important new status in planning and policymaking at the highest level of government." [6] In 1969 these ideas became reality.

The two bills that became NEPA were largely modeled after the Employment Act of 1946.[7] That Act, which grew out of the concern about economic dislocations after World War II, declared a responsibility in the Federal Government to maintain a prosperous and stable national economy.[8] The Act also created the three-man Council of Economic Advisers to advise the President in carrying out that responsibility and in preparing an annual report on the economy.[9] The Employment Act was a watershed in the Federal Government's relationship to national economic problems. By following both aspects of that Act—declaring a Federal responsibility for action and providing for a council and an annual report—the sponsors of the 1969 bills hoped to create a similar watershed in the Government's relationship to environmental problems.

Instead of being an inadvertent contributor to environmental degradation, the Federal Government was to be made a central participant in environmental renewal. The bills directed the President to submit an annual report to Congress on the state of the environment. Similar to the President's annual Economic Report, it would serve over the years as an indicator of environmental conditions, a record of governmental and private actions to enhance environmental quality, and a forum for raising important environmental issues.

During consideration of the bills which led to NEPA, some supporters of the proposed law feared that the declaration of a national environmental policy might be an empty utterance unless the statute embodied some means of guaranteeing that Federal agencies would heed the new policy. Witnesses repeatedly referred to the disastrous oil blowout in early 1969 from offshore wells operating under Interior Department leases in the Santa Barbara Channel. Prior to the blowout, they said, the Federal Government had assured that environmental factors had been considered and that precautions had been taken to prevent oil spillage. Events showed that the Government's assurances had been more thorough than its precautions.[10] Witnesses supporting the proposed legislation produced many other examples of what the Senate report later termed "the manner in which Federal policies and activities have contributed to environmental decay and degradation." [11] They called for an "action-forcing" mechanism that would guarantee that in the future the Government would follow through in its pledge to protect the environment.[12]

Congress' response to this need was the provision that became section 102 of NEPA, a provision without a close statutory precedent. The section directs all Federal agencies to interpret and administer their authorities in concert with the new environmental policy. Subsection 102(2)(C) requires agencies to prepare, for all "major Federal actions significantly affecting the quality of the human environment," a detailed statement of what the environmental impacts will be. In preparing the statement, agencies must consider alternative actions and consult with other agencies having environmental expertise.

The written record of NEPA's passage through the Congress is relatively sparse in view of its later impact. In the Senate on July 10, 1969, after a single day of hearings, it was placed on the consent calendar and passed by a voice vote.[13] In the House, it reached the floor on September 23 and was passed that day by a vote of 372 to 15.[14] On October 8, the Senate conferees from the Interior Committee and members of the Senate Public Works Committee reached agreement on the Senate's position in conference with the House. They also spelled out the relation of NEPA to a companion bill from the Public Works Committee that later became the Water Quality Improvement Act of 1970.[15] A joint Senate-House conference committee reported an agreed version on December 17. After a brief discussion on the Senate floor of the effect of the proposed Act on other Federal laws relating to the environment, the Senate and House agreed to the conference report on December 20 and 23 respectively.[16]

precursors of section 102

Although the "action-forcing" provision of section 102, requiring environmental impact consideration, had no direct legislative model, it had foundations in a number of earlier legislative and judicial developments relating to environmental protection. The importance of section 102 is that it brings these separate strands together and confirms them in a statute applicable across the entire Federal Government.

Individual agencies previously had mandates to consider particular environmental concerns in planning their activities. One of the earliest such mandates is section 10(a) of the Federal Power Act.[17] As amended in 1935, that law requires the Federal Power Commission (FPC), in licensing any dam or related project, to consider the interests of commerce, water power and "other beneficial public uses, including recreational purposes." Two landmark court decisions interpreted this requirement as imposing an affirmative duty on the FPC to investigate and consider less environmentally damaging alternatives to any proposal. In *Scenic Hudson Preservation Conference* v. *FPC*,[18] decided in 1965, the U.S. Court of Appeals for the Second Circuit ruled that section 10(a) requires the FPC to consider "[t]he totality of a project's immediate and long-range effects." It said the FPC cannot fulfill this responsibility by sitting "as an umpire blandly calling balls and strikes for adversaries appearing before it; the right of the public must receive active and affirmative protection at the hands of the Commission." [19] Two years later, in *Udall* v. *FPC*,[20] the U.S. Supreme Court gave its sanction to this reading of the Act.

In 1966 the Congress enacted section 4(f) of the Department of Transportation Act,[21] which requires the Department of Transportation (DOT) to consider alternatives to proposed transportation projects that affect the environment. Section 4(f) provides that before the Department may approve a transportation project that encroaches on a public park, wildlife refuge, or historic site, the Secretary of Transportation must find that there is no feasible and prudent alternative and that the project has been planned to minimize the encroachment. Together with section 10(a) of the Federal Power Act, this requirement presaged the broad duty imposed by NEPA to explore less environmentally damaging alternative actions.

NEPA's provision that agencies preparing impact statements must consult with agencies having environmental expertise also had precursors. The Fish and Wildlife Coordination Act,[22] as amended in 1958, was intended to bring concern for wildlife into the planning of Federal water resource projects. To help guarantee that wildlife values are fully considered, it requires Federal agencies to consult with the Federal Fish and Wildlife Service and State wildlife authorities in planning water resource projects. The National Historic Preservation Act of 1966 [23] creates a similar consultation mechanism to protect historic buildings and sites from encroachment by federally funded projects. Each of these consultation requirements is designed to assure that the governmental bodies charged with protecting environmental values pay close attention to the environmental effects of particular projects. Agencies can combine their consultations under these statutes and under NEPA's broader requirement and thus avoid any duplication of effort.[24]

The "action-forcing" provisions in section 102 of NEPA build upon the foundations of the four earlier laws and apply to all types of Government activities. Teamed with NEPA's establishment of a national environmental policy and its creation of the Council on Environmental Quality, section 102 provides a mechanism for significant reform in Government decisionmaking.

nepa's substantive impact

a new policy is set

Although much of the public discussion of NEPA has revolved around the environmental impact statement procedure of section 102(2)(C), NEPA's substantive thrust cannot be overlooked. The primary purpose of Congress in enacting NEPA was to establish a Federal policy in favor of protecting and restoring the environment. The broad terms in which that policy is declared clearly make all aspects of man's surroundings the subject of Federal concern.[25]

NEPA contains strong directives to Federal agencies to follow this new policy. Section 102(1) "authorizes and directs that, to the fullest extent possible, . . . the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with" the policy of the Act. The legislative history of NEPA indicates that the phrase "to the fullest extent possible" at the outset of section 102 is intended to excuse compliance only when another statute expressly precludes or makes action required by NEPA impossible.[26] Section 102(1) is supplemented by section 102(2)(B), which directs agencies to give "appropriate consideration" to environmental values in all decisions; by section 103, which directs Federal agencies to review existing policies and practices to bring them into line with the Act; and by section 105, which declares that the policies and goals of NEPA "are supplementary to those set forth in existing authorizations of Federal agencies." [27]

Together, these provisions tell the agencies to add a new criterion—effect on the environment—to those against which they have traditionally tested their actions. The far-reaching result is that agencies whose statutory mandates previously did not call for attention to the environmental effects of their actions are now required to take those effects into account. And agencies whose mandates previously directed their attention only to certain facets of the environment now have a responsibility as broad as the environmental policy declared in NEPA.

The implications of this reform are seen most clearly in Federal programs in which the Government acts directly to perform a service, to build a facility, or to finance such activities by others. In these programs the agency in charge generally has a broad range of choices about the size, nature, and location of the project, who receives the funds, and the wisdom of undertaking any action at all. For example, the Army Corps of Engineers determines, on the basis of its own studies, whether to seek Congressional authorization for a flood control project in a certain location and what the design of the project should be. Similarly, when the Department of Housing and Urban Development (HUD) allocates grants and other assistance under Federal housing programs, it can select projects to maximize the benefits produced. It does this both in setting general criteria for the programs and in evaluating specific projects. In planning such actions, Federal agencies are now required by NEPA to consider environmental factors at the earliest possible stage and to mold their actions to improve the environmental effects. This duty includes refraining from action when the balance of the relevant public values, including the environment, indicates that the action is not in the public interest.[28]

NEPA's implications are similar where the Government does not undertake or finance activities directly but regulates the private concerns that do. A Federal agency charged with regulating private rights or interests must consider the environmental effects of its regulatory activities and make appropriate changes. For example, in granting permits to dredge or fill in navigable waters of the United States, the Corps of Engineers must consider the ecological effects of the applicant's proposed activity.[29] Before the Coast Guard decides whether to grant a permit for construction of a bridge across navigable waters, it must consider the reasonably foreseeable effects on scenic values, on the surrounding transportation system, and on public access to the adjacent coastline.[30] And the Interstate Commerce Commission, in regulating the rates charged by interstate carriers for freight transport, must consider the impact of different rate structures on the economic feasibility of recycling depletable resources.[31]

Where an agency previously looked at only a limited aspect of the private activities under its regulation, NEPA forces it to broaden its concerns substantially. The Atomic Energy Commission (AEC), which previously considered only the radiological health and safety effects of nuclear powerplants, now must consider all other significant environmental effects as well, such as the impact on adjacent waters of thermal discharges from the plants.[32] For the other regulatory agencies, too, the NEPA provisions supplement preexisting statutory objectives with a new one—environmental protection. An agency must consider and, as appropriate, act to minimize the adverse environmental effects that can reasonably be expected from the activity subject to its regulatory action.

The actual impact of NEPA's policy on Government decisions can already be seen. Some projects have been modified or abandoned when their environmental effects would have been unacceptable. For example, on the advice of the Council on Environmental Quality, the President ordered a halt in construction of a partially completed barge canal across northern Florida that threatened important natural values. The President stated: "[W]e must assure that in the future we take not only full but also timely account of the environmental impact of such projects—so that instead of merely halting the damage, we prevent it." [33] The Government has since recommended that the area be studied for possible protection as part of the wild and scenic rivers system.[34]

Other examples of NEPA's impact cover a wide range of Government actions.

The Coast Guard carefully reviewed an application from the State of California for a permit to build a highway bridge across San Francisco Bay. Because of potential long-range effects on the environment, including a threat to the viability of San Francisco's new rapid transit system, the Coast Guard denied the permit. In a subsequent public referendum, the voters of the area disapproved the bridge project.[35] When a detailed and comprehensive environmental statement showed that the originally preferred route of Interstate 75 in Georgia would have adverse effects on Allatoona Lake and surrounding natural areas, a new alignment which minimized impacts was selected.[36]

The Army Corps of Engineers postponed indefinitely a project to channelize portions of the Buffalo Bayou in Houston, Texas, largely because of its negative aesthetic effects.

The draft environmental impact statement for a proposed airport site in Fairfax County, Va., prompted adverse comments from many sources. The County Board of Supervisors subsequently decided to make the site a park instead.[37] Environmental concerns triggered rethinking of a plan to use a tract of Federal land adjacent to a recreational area in Fort Snelling, Minn., as the site for a bulk mail handling facility for the Postal Service. The Government decided instead to transfer the land to the State of Minnesota for park use.[38]

When the California coastal communities of Bolinas and Stinson Beach applied to EPA for a grant for a joint sewerage system, EPA reviewed the environmental implications of the proposal. EPA's study indicated that the proposal would allow immediate urbanization of a rural area over the protests of a majority of the residents, would bring serious financial hardship to the property owners of the area, and might harm the ecology of the most significant shale reef on the West Coast. Discussion of these preliminary findings with the applicants and the State led to the abandonment of the project and the formulation of an alternative more compatible with the local environment.

Original designs for the proposed new community of Park Forest South, outside Chicago, called for the destruction of a unique hardwood forest. After the draft impact statement brought this to light, the Government and the developer reached an agreement to change the plans, and the Illinois State legislature is considering a bill to buy and preserve the woods.[39]

The Secretary of the Interior in 1971 refused, on environmental grounds, to authorize two proposed platforms on existing oil leases in the Santa Barbara Channel.[40] In a later proposed sale of oil and gas leases off the eastern coast of Louisiana, the Secretary, after preparing an environmental statement, eliminated a number of proposed lease sites believed potentially dangerous to nearby Wildlife Refuges and associated marshlands and estuaries.[41]

Changes in individual projects are only a partial index of NEPA's impact. Perhaps a more important sign is that agencies are reviewing their policies to determine the need for across-the-board changes affecting entire Federal programs. For example, the Forest Service has modified its multiple-use planning framework for the National Forests. Instead of a collection of functional plans and a multiple-use plan, the Forest Service will prepare an overall management plan for each planning unit, guided by NEPA principles.[42] The Corps of Engineers, under its dredge-and-fill permit rules, reviews very closely any new proposals to develop wetlands.[43] The AEC's new procedures under NEPA are likely to have a significant impact on nuclear power plant technology by requiring more careful accounting of long-term environmental costs than was previously the practice.[44] The President's Executive Orders establishing the Refuse Act permit program, providing for regulation of off-road vehicles on public lands, and barring the use of poisons in Federal predator control programs all have drawn on NEPA as part of their statutory authority.[45]

programs involving many actions

A practical problem may arise when an agency that makes many individual decisions in a program affecting the environment must implement NEPA's policy. Many agencies find themselves in this situation. For example, the Forest Service grants numerous permits for access to private mineral claims on National Forest land. The Corps of Engineers issues a large number of permits for dredging and filling in navigable waters. For the agency to consider all relevant factors and balance them anew in taking each action may be undesirable for several reasons: It may waste the agency's resources; it may fail to ensure consideration of cumulative long-term effects; and it may mislead applicants about what they may expect from the agency.

It has long been recognized that agencies can administer their programs better if they establish their policies and practices, whenever possible, by general rule rather than by acting on a case-by-case basis.[46] Rulemaking allows the agency to weigh competing considerations in depth and to determine a future course of action that will best accomplish its ends. Sometimes it will not be possible to prescribe general rules, because the individual cases differ too widely or the problems do not lend themselves to generalization. But where it is possible, it is a valuable governmental technique.

General rules can be just as valuable in bringing agency practices into line with NEPA as they have been in implementing other Federal policies. NEPA requires a rather finely tuned and systematic balancing of its policy against other agency objectives.[47] It requires agencies to reexamine the basic premises on which they have operated and to take a new direction when those premises do not square with the required concern for environmental effects.

Nothing in NEPA says that such balancing or reexamination must be performed anew each time the agency proposes to act, without regard to previous agency consideration of the relevant interests. No person or institution can operate effectively under a requirement to question its basic premises before taking each action. But consideration of the environment must be dynamic. New situations must be evaluated, and new knowledge must be brought to bear. An agency can be both effective and responsible if it adopts rules to guide its daily choices and reexamines those rules as necessary to respond to changes in circumstances or in public policy. Environmental issues not adequately covered in the rulemaking process can be considered on a case-by-case basis. As pointed out below, an agency can follow a similar approach in preparing impact statements under section 102(2)(C).

Agencies need, therefore, to identify areas in which NEPA's policy can best be applied by general rules, as distinguished from areas in which some or all issues must be evaluated with each individual action in mind. If, for example, an agency can identify beforehand the circumstances under which a type of development carries unacceptable environmental risks, it can formulate a corresponding rule to guide applicants for Federal assistance or authorization. The Interior Department has taken this approach in issuing rules to govern the development of geothermal steam under the Geothermal

Steam Act of 1970,[48] and the Forest Service is considering similar rules to govern means of access to mining claims on National Forest lands. Similarly, if it can be determined what level of pollutant emissions will be acceptable from a class of activities, a general rule can be framed to guide the exercise of a Federal authority. This principle underlies the Federal regulatory programs for air and water pollution. It may be equally valuable, where appropriate, in other Federal programs which involve many individual actions.

The question arose in *Calvert Cliffs' Coordinating Committee* v. *AEC* [49] whether an agency may, in selecting a rule of general applicability to implement NEPA, defer to a relevant rule prescribed by another agency with environmental expertise. The AEC, in its procedures for implementing NEPA, had provided that a State certification of compliance with water quality standards under the Federal Water Pollution Control Act was sufficient to remove the issue of water quality effects from further consideration in an AEC proceeding for licensing a nuclear powerplant. The U.S. Court of Appeals for the District of Columbia held that such automatic deference to another agency's views was inconsistent with AEC's duty under NEPA to consider all environmental factors in its licensing actions. The AEC had based its procedures on two special factors: section 21(b) of the Federal Water Pollution Control Act (added by the Water Quality Improvement Act of 1970),[50] which required the State certification, and Congressional statements about the interplay of section 21(b) with NEPA.[51] The appeals court ruled that NEPA required the AEC to assess water quality effects independently, regardless of a certification of compliance with standards under section 21(b). The court reasoned that by making an "individualized balancing analysis" in each case, the AEC could "ensure that, with possible alterations, the optimally beneficial action is finally taken." [52]

It is not entirely clear whether the AEC or the court of appeals correctly judged the Congressional intent concerning the relationship of section 21(b) to NEPA. Legislative clarification of the issue is found in bills since passed by both the House and Senate to amend the Federal Water Pollution Control Act. Those bills carry a provision, supported by the Administration, allowing the AEC and other permit-granting agencies in their NEPA evaluations to rely on State certifications that water quality effects will be acceptable. However, permit-issuing agencies still would be required under NEPA to balance water quality effects along with other factors in making the final permit decision.[53]

The question of whether one agency can defer to another agency's finding of compliance with water quality standards may have limited importance in view of this prompt Congressional move to clarify the law. However, it is important to note that, despite the stress in *Calvert Cliffs'* on an "individualized balancing analysis," the opinion does not say that an agency cannot turn to its own general rules to guide all or part of individual decisions. As already pointed out, NEPA requires an agency to balance all competing factors and to consider all reasonable alternatives. But it does not dictate that this be done entirely anew in each decision, without the assistance of general rules and past experience. Decisionmakers are permitted to cut their more complicated decisions down to manageable size. Advance determination of program policy through rulemaking can implement NEPA, at the same time avoiding repetitious reexamination of basic principles in the context of each individual action.

mandate for innovation

NEPA not only requires Federal agencies to appraise and improve the environmental effects of their activities; it also mandates agencies to develop new governmental initiatives to tackle the Nation's growing environmental problems. Section 101 declares that it is "the continuing policy of the Federal Government . . . to use all practical means and measures . . . to create and maintain conditions under which man and nature can exist in productive harmony."[54]

While this responsibility for governmental innovation rests on all agencies of the Federal Government, NEPA contemplates that a central role will be played by the Council on Environmental Quality. Section 204(4) tells the Council "to develop and recommend to the President national policies to foster and promote the improvement of environmental quality . . . ."[55] The President has reaffirmed this responsibility in Executive Order 11514.[56] The Council, working closely with other Federal agencies, has had the responsibility for preparing new environmental initiatives that have been included in the President's Environmental Messages in 1971 and 1972.[57] Chapter 4 discusses in detail the activity of the Council and other agencies in this area.

This affirmative responsibility of the Government to anticipate environmental problems and to devise ways of solving them gives hope for reversing the deterioration of our surroundings. If the Federal Government responds vigorously to NEPA's dual command to control the environmental effects of its actions and to devise new means of environmental protection, it will have been faithful to its new responsibility for the conditions under which we live.

the evolving impact statement process

The environmental impact statement process of section 102(2)(C) was included in NEPA to insure an across-the-board Government response to the Act's policy directives. That process, requiring a public explanation of the environmental consequences of proposed Government actions, compels substantial adjustments in the ways in which many agencies previously did business. Like any major governmental reform, the process has raised a number of thorny problems in its early implementation. The Council, acting under Executive Order 11514, has issued guidelines instructing the agencies on how to handle many aspects of the 102 process.[58] The Council also gives agencies additional guidance on a more informal basis.[59] Because the guidelines are an interpretation of NEPA by the agency charged with its implementation, a number of courts have acknowledged that they are entitled to great weight under accepted legal principles.[60]

Among the major problems that still persist, three types of issues recur: what procedures agencies must follow in preparing and circulating 102 statements, what the statements must contain, and what role the Council on Environmental Quality plays in the 102 process.

procedural problems

actions requiring impact statements—Section 102(2)(C) requires an environmental impact statement for "major Federal actions significantly affecting the quality of the human environment." [61] The legislative history contains little discussion of the meaning of this phrase. And the courts are only beginning to furnish some guidance in interpreting the phrase, when they are asked to review its application to a particular agency action.[62] Probably the best guide to Congress' intent is the strong concern, voiced throughout the hearings leading to NEPA's enactment, for preventing unanticipated environmental effects from Government actions. The Act calls for statements only on major actions with significant environmental effects. With that language it attempts to ensure that the great bulk of the environmental impact wrought by Federal agencies will be analyzed through the 102 process, while avoiding the wasteful preparation of statements on minor actions or actions with insignificant environmental consequences.

Both terms, "major" and "significant," are relative, calling for a reasonable exercise of judgment in light of the NEPA policy. Because the section 102(2)(C) requirement is addressed to the agency proposing to take an action, it is that agency which must initially decide the applicability of the terms in light of its knowledge of the nature and effects of its programs. The Council on Environmental Quality has attempted to guide this exercise of judgment through section 5 of its guidelines.[63] Moreover, the Council is always available to consult with agencies regarding particular programs or actions. However, the great diversity of Federal activities subject to the 102 process makes it impossible for the guidelines to do more than elaborate in general terms upon the statutory language.

The guidelines make clear, for example, that the overall, cumulative impact of one or more actions is to be considered and that an effect may be significant even though it is limited to one locality. The guidelines also call upon each agency to issue its own procedures to implement the 102 process. Those procedures are intended both to identify agency programs that are likely to involve actions requiring statements and to specify the factors that will guide decisions in individual cases. Virtually all the major agencies have now published such procedures.[64]

The duty to assess the environmental consequences of a proposed action, which flows from sections 101, 102(1), 102(2)(B), 103, and 105, is not limited to major and environmentally significant actions—as is section 102(2)(C). Further, determining whether an action falls within section 102(2)(C) calls for an early inquiry into what the effects may be. Therefore, in practice, an agency contemplating any action that may possibly affect the environment must perform an environmental assessment and decide whether a statement is necessary.[65] A few agencies, including the Environmental Protection Agency (EPA), have experimented with a practice of issuing a notice of intent when this preliminary look indicates that a 102 statement is required. The notice alerts the public that the statement will be coming, offering an opportunity for early input. Moreover, it provides a public record of the time when preparation of the statement was started. Similarly, an agency may make a negative declaration when it decides that a statement is not required. The agency should, in appropriate cases, prepare a record indicating, for future reference, why a 102 statement was considered unnecessary.[66]

In the first years of the 102 process, many of the controversies over whether 102 statements were required have involved Federal activities begun or authorized before NEPA's enactment. The Act contains no transitional language to condition its command that any major action with significant environmental effects taken after its enactment must have an environmental impact statement. Because many such actions are part of a continuing program or project started before NEPA took effect, agencies have often faced the question whether to prepare a 102 statement that would involve reappraisal of past actions or financial commitments.

To deal with these situations, section 11 of the Council's guidelines provides that a 102 statement is necessary to assess further incremental major actions. However, the scope of alternatives realistically available to the agency in such cases may be narrower in light of how nearly complete the project was at the time NEPA took effect. If prior commitments, legal or financial, make it impractical to change the basic course of action, there should still be a 102 statement discussing the project's environmental effects and the possibilities for minimizing adverse environmental consequences from the remaining major actions.

In early lawsuits testing the applicability of section 102(2)(C) to previously commenced projects, some of the courts failed to distinguish the major Federal actions yet to be taken—if any—from the earlier commitments made. This failure led to an erroneous characterization of the problem as one of retroactive application of NEPA to actions already taken. That failure also led to a corresponding failure to analyze whether the remaining Federal steps offered an opportunity to improve the project's environmental impact.[67] However, in more recent decisions the courts have turned increasingly to the approach in section 11 of the guidelines.[68]

The problem of applying section 102(2)(C) to pre-1970 projects has already faded in importance as the courts have gravitated toward a uniform approach. It should recede even further as the remainder of the projects that were in the pipeline when NEPA was enacted are processed and the agencies are able to turn their attention to new projects for which environmental assessments can be performed from the outset.

The retroactivity problem remains intense in the licensing of nuclear electric powerplants. A number of plants were completed or under construction when NEPA was passed and will be ready this year and next to begin producing electricity in areas of possible power shortage. A Federal court decision enjoining the startup of the Quad Cities plant on the Mississippi River raised legal uncertainty whether those plants will be available when needed.[69] The case has since been settled. But the House of Representatives has passed, and the Senate is considering, a short-term amendment of NEPA to permit the AEC to use emergency procedures to meet urgent needs in the licensing of plants that predate NEPA. The amendment would permit use of these plants on the basis of an abbreviated review through the summer of 1973, pending completion of full 102 statements.[70]

program impact statements—As noted above, many Federal agency programs involve a multiplicity of individual actions, such as grants or permits, administered under relatively uniform policies. It was pointed out that NEPA's substantive duties can often best be implemented in such cases by writing environmental policies into the general rules governing a program. Similarly, the procedural duties of section 102(2)(C) can often be implemented more effectively by preparing a single statement on the program as a whole rather than by filing separate environmental impact statements on the individual actions. An intermediate possibility is to prepare an overall statement assessing basic policy issues common to all actions under a program, then to follow it when necessary with a separate statement for each major action, limited to issues needing individualized treatment. This range of possibilities is present also when a large project is divided into small segments for administrative purposes—as in the case of a major highway project.[71]

In many such instances the purposes of section 102(2)(C) will best be served by an umbrella program environmental impact statement. The statement may be prepared at the time the general rules for the conduct of the program are issued, or it may simply emerge from the thorough reexamination that NEPA requires for ongoing programs. The program 102 statement affords an occasion for a more comprehensive consideration of effects and alternatives than is practicable in a statement on an individual action. It tends to ensure that cumulative impacts likely to be slighted in a case-by-case analysis are considered. And it avoids duplicative discussion of basic policy questions. A program statement can be supplemented or updated as necessary to account for changes in circumstances or public policy and to measure cumulative impacts over time.

However, a program statement would not satisfy section 102(2)(C) if it were superficial or limited to generalities. The very rationale for a program statement requires that environmental considerations be analyzed fully. When all significant issues cannot be treated adequately in connection with the program as a whole, statements of more limited scope will be necessary on some or all individual actions to complete the analysis.

This discussion illustrates the sophisticated judgments that an agency must make in applying NEPA's general procedural requisites to its programs. The complexity of the agency's task is increased by the impossibility of doing everything at once. An agency must time its preparation of program and individual statements to accomplish NEPA's ends in the light of its other program objectives. When a new program is just beginning, the obvious course is for the agency to prepare an environmental impact statement before the program is launched. The Department of the Interior has followed this course in beginning exploratory development of oil shale and in launching the exploitation of geothermal steam.[72]

multi-agency actions—Many Federal activities are the shared responsibility of more than one agency. For example, a highway project may be funded by the Department of Transportation but also require a permit from the Corps of Engineers to fill or build in a navigable waterway. A combined water resource and recreation project may require the cooperative efforts of the Corps of Engineers, a river basin commission, and the National Park Service. Or a major new policy may be initiated by the Government and its implementation will require coordinated actions by several agencies. In these instances each agency involved may prepare its own impact statement. But there are two other approaches that will usually be more effective in complying with section 102(2)(C): One is to designate a "lead agency" responsible for preparing a statement prior to implementing the program or policy. Another is for the agencies to prepare a joint overview statement.

Assigning responsibility to a lead agency may be most appropriate when the action is essentially a single project in which two or more agencies are involved by virtue of their separate legal authorities. Each agency's decision may relate to only a part of the project, but in an environmental impact statement it would have to consider the cumulative impacts of the project as a whole. Therefore, it will be most efficient for the agencies involved to agree which is the lead agency and assign it the responsibility to prepare a statement.

The Council's guidelines provide that the lead agency is the Federal agency which has primary authority for committing the Federal Government to a course of action with significant environmental impact.[73] At least three factors come into play in picking the lead agency: which agency became involved in the project first, which has the heaviest involvement, and which is most expert with respect to the project's environmental effects. The Council is ready to assist agencies that have difficulty selecting a lead agency. Moreover, in preparing the statement the lead agency may call on the other agencies involved for help, or on other agencies with relevant expertise. Agencies may find cooperative arrangements very useful. The guidelines indicate that the lead agency's 102 statement normally should be released in final form before any of the participating agencies has taken major or irreversible action on the project. The courts have recognized that the lead agency device can be a proper way to satisfy NEPA's procedural demands in a multi-agency context.[74]

An overview statement, prepared jointly by a number of agencies, may be especially appropriate for new policy initiatives formulated at an interagency level. In the shaping of policy on a major issue with environmental implications, it is necessary to explore a broad range of alternative actions that fall outside the authority or expertise of any single agency. Even the narrower course of action ultimately chosen often requires implementation by several agencies. Preparation of an overview statement by an interagency group can make use of each agency's special knowledge while avoiding the duplication inherent in separate statements. In addition, it can assure that a full environmental analysis is performed before the Government sets out on a course of action. When later specific implementing actions require additional 102 statements, those statements can rely on the overview statement for discussion of the general policy issues.

A judicial discussion of the role of an overview statement came in a lawsuit under NEPA challenging a proposal by the Department of the Interior to sell leases for oil and gas exploration on the Outer Continental Shelf. The proposal was one of the initiatives arising out of the President's 1971 Energy Message. Although the studies leading up to the Message included environmental factors, the preparation of environmental impact statements was left until the time of the implementing actions of the Department of the Interior, the AEC, and other agencies. The Department of the Interior's proposed offshore lease sale proved to be the first action to implement the President's Message. The responsibility fell to Interior to act as the lead agency in discussing the broad range of alternative energy sources to be assessed in connection with the entire package of initiatives.

In a court test of this procedure, the U.S. Court of Appeals for the District of Columbia held that, although a joint overview statement might have been prepared in connection with the Energy Message, it was legally permissible "to defer the impact statement from the time of programmatic directive to the time of the implementing specific actions."[75] However, because the energy policy involved numerous and diverse initiatives, Interior's 102 statement covering its lease sale did not rule out a need for additional statements covering the other major actions. For example, the Atomic Energy Commission has prepared an impact statement covering its project for demonstrating a liquid-metal fast-breeder nuclear reactor.[76]

Some duplication will necessarily occur in these multiple statements. Moreover, each agency involved must discuss alternatives and environmental effects outside its areas of primary expertise. For these reasons, an early overview statement has advantages over the other approaches when a number of proposed actions are part of a coordinated plan to deal with a broad problem. It can be expected that overview statements will find more extensive use in the future.

A similar need for interagency coordination arises when an activity requiring a 102 statement is also subject to a like environmental evaluation process under State law. As noted in Chapter 5, at least 10 States[77] and Puerto Rico now have an impact statement process for State or local agency actions affecting the environment. A number of other States are considering such laws. More and more instances will occur in which a project involves both State and Federal agencies and requires environmental assessments under both State and Federal law.

In most of these cases the agency whose involvement in the project comes first will be the first to evaluate its environmental effects. This will usually be a State agency which formulates or approves a proposal before sending it on for Federal action. For example, State and local agencies initiate proposals for construction of sewage treatment plants and recommend the proposals to EPA for Federal funding. If State law requires an environmental analysis, the appropriate State or local agency will usually complete the analysis before referring the proposal to EPA. EPA will then have the benefit of the State's study in preparing a 102 statement if the project requires one under NEPA. Experiments are already underway in some States with joint State-Federal preparation of impact statements.

State and Federal agencies should cooperate closely in these situations to minimize any duplication of effort. The basic studies, whether performed by the State or Federal agency or jointly, can be tailored to help satisfy both the State and Federal requirements. Moreover, it should generally be possible to combine the comment processes under both laws, to avoid consulting expert agencies twice. The result of the State impact statement requirement will be to ensure that environmental effects get attention early in the development of proposals by State agencies, even before the Federal involvement would otherwise begin.

the comment process—NEPA requires each agency, prior to completing a 102 statement, to "consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved." The comments thus obtained, as well as those from relevant State and local agencies, are to accompany the proposal "through the existing agency review processes" and are to be made public with the 102 statement.[78]

The Council's guidelines make clear that these requirements also include the comments of private organizations and individuals.[79]

To enable all of these entities to make informed comments, the guidelines require that draft statements be circulated to other agencies and released to the public for review at least 90 days before the proposed action. The agency must consider the comments its receives and change its proposal and the statement as appropriate. The agency must then make the final statement and comments public at least 30 days before taking action. Agencies may consult with the Council about modifying these time limits to meet emergency situations or when program effectiveness is threatened.[80] When a public hearing is held, the draft statement is made available at least 15 days beforehand—to permit informed discussion of environmental issues at the hearings.

These provisions for review and comment have impacted heavily on the Federal Government. They have opened to public participation many Government decisions that were previously made informally and without prior public notice. The Council believes that NEPA's public comment process can be assimilated into the agencies' existing planning and review procedures for new proposals and still delay decisionmaking little, if at all. The comment process can be an important step toward a more open and responsive Government when environmental issues are involved.

Agencies and private groups whose interests and expertise put them frequently in a commenting role on draft 102 statements have complained at times of the difficulty of preparing helpful comments in only 30 to 45 days. For example, the Department of the Interior is asked to comment on hundreds of proposed actions affecting land use and fish and wildlife values. EPA, with its expertise in pollution control, faces a similar situation. EPA's workload is increased by section 309 of the Clean Air Act. Enacted shortly after NEPA, section 309 supplements NEPA's general comment provisions with a requirement that EPA review and comment publicly on Federal actions that affect its areas of responsibility.[81] Private environmental groups, too, often find their resources taxed by the opportunities for comment on Federal actions.

One answer to this problem, obviously, is for the commenting entities to add the staff and other resources to handle the commenting task. The opportunity to make Federal decisionmaking better informed and more carefully planned warrants the necessary manpower. However, even with adequate resources, it is often impossible to prepare comments in 30 days that will do justice to a draft statement that may have taken years to prepare. It is probably impracticable to solve the time problem by an across-the-board extension of the minimum period between circulation of the draft statement and agency action. A significant extension would impose a delay incompatible with the nature of some Government programs.

Agencies are free, of course, to take longer when the program permits and when NEPA's policy would be served by deeper scrutiny. For example, the Department of the Interior permitted extensive time for comment and held hearings in the District of Columbia and in Alaska before writing its final statement on the Trans-Alaska Pipeline System. But in most cases improvement of the comment process will require that agencies develop means of giving ample advance notice and encourage consultation before the draft statement is finished. By making other agencies and groups aware that a draft is being developed, an agency can give them time to prepare for the upcoming opportunity to comment. Such a warning may also bring in a faster feedback that permits earlier modification of the proposal and thereby avoids later confrontation. Some agencies already are developing the means of earlier notice and consultation. Further experimentation promises substantial benefits in making the comment process a more effective tool.

A question persists about how a draft statement should compare to a final statement in content and comprehensiveness. The draft serves as the primary means of informing others about the environmental effects of a proposed action and of possible alternative actions. Therefore, it should embody a thorough airing of each of the points specified in section 102(2)(C). By the time it circulates a draft, the initiating agency should have fully explored those points, with help from other sources when necessary, rather than leaving parts of the analysis to be furnished by commenting groups. In short, a draft statement should be capable of serving as the final or "detailed" statement if no comments come back.

However, the very rationale for consultation with others is that a commenting agency or group may uncover errors or omissions in the original environmental analysis. The final statement, when issued, thus will ideally be comprehensive and will give accurate guidance in the agency's decision whether to go ahead as planned, modify the project, or abandon it. However, if a final statement is challenged in court and found legally defective, it can be further revised, and the ultimate product will reflect the court's legal guidance.

One argument holds that when a commenting group or reviewing court has pinpointed a defect in a statement, it should be corrected in a new draft and the new draft circulated for additional comments. One Federal district court, in a case involving the Interior Department's proposed offshore Louisiana oil and gas leases, appears to have adopted this view.[98] However, to impose a flat requirement of recirculation, even when the project itself is not changed, could cause unnecessary repetition and delays, often with little gain in fulfilling the purpose of section 102(2)(C). Indeed, it might create an incentive for an agency not to improve its statement after circulating the draft. A commenting group or reviewing court may contribute valuable factual or legal insights which can then be incorporated into the statement. If the defect is fully corrected in the revised statement, then the 102 process has accomplished its primary goal: a thorough environmental analysis incorporated in a document for the decisionmaker that is made public at least 30 days before any proposed action. Other agencies and groups have been apprised and have contributed to the analysis. Recirculation should be considered only when the second statement discusses significant new issues. Judgments on the need for recirculation are best made on a case-by-case basis. But at some point the process of circulation and comment must end.

A different situation exists when, after a draft statement is circulated, an agency changes its plans and proposes an action not even discussed as an alternative in the draft. In that event the agency has in effect come up with a new proposal on which other agencies and the public have not had a chance to comment. Such a new proposal should be the subject of a draft statement of its own whenever the proposed action is major and the environmental effects significant.

environmental regulatory activities—Section 102(2)(C) requires "all agencies of the Federal Government" to prepare environmental impact statements on major actions significantly affecting the environment. However, the discussions leading to the enactment of NEPA showed that the primary concern of the Congress was the many Federal Government agencies that did not have a clear mandate to consider environmental effects and to protect the environment. The Congress recognized that Federal programs, such as the air and water pollution regulatory programs, already operated under statutes designed to protect the environment. The relationship of NEPA's more general environmental commands to those existing statutes was considered in the debate leading to NEPA's enactment.

In a statement on the Senate floor shortly before NEPA's final passage, Senator Jackson of Washington, its principal Senate sponsor, said:

> Many existing agencies such as the National Park Service, the Federal Water Pollution Control Administration and the National Air Pollution Control Administration already have important responsibilities in the area of environmental control. The provision[s] of section 102 (as well as 103) are not designed to result in any change in the manner in which they carry out their environmental protection authority. This provision is, however, clearly designed to assure consideration of environmental matters by all agencies in their planning and decisionmaking—especially those agencies who now have little or no legislative authority to take environmental considerations into account.[83]

Similar statements were made in both houses of Congress.[84] They show Congress' clear understanding of NEPA's substantive impact: As recited in section 105, NEPA's requirements were to supplement, but not supplant, "those set forth in existing authorizations of Federal agencies." [85]

However, the question has since arisen whether the procedural duties of section 102(2)(C) apply to environmentally protective regulatory programs. Were agencies administering those programs, though guided by other environmental legislation, nevertheless to prepare 102 statements when their regulatory actions significantly affected the environment?

Relying on the statements in NEPA's legislative history that section 102 was "not designed to result in any change in the manner in which [agencies with environmental regulatory responsibilities] carry out their environmental protection authority," the Council in its guidelines interpreted NEPA as excluding the exercise of such authority from the 102 requirement. The President, shortly after NEPA's passage, consolidated most of the Federal pollution control regulatory programs into the new Environmental Protection Agency. Therefore, section 5(d) of the Council's guidelines limits exemption from the 102 process to "environmental protective regulatory activities taken or concurred in by" EPA.[86]

NEPA itself contains no specific guidance on this point. As a result, there has been disagreement about the authority for, and scope of, this exemption. The disagreement led to decisions by two Federal district courts—in *Kalur* v. *Resor* and *Sierra Club* v. *Sargent*—that the water quality permit program, established under the Refuse Act of 1899 and administered by the Corps of Engineers with EPA concurring on each permit, was subject to environmental impact statements.[87] In three other cases, business groups are arguing that EPA must prepare 102 statements when it sets air pollution standards.[88]

In order to clarify the uncertainty, EPA has started a study of the effects of applying the 102 process to its regulatory activities. That study will permit EPA to specify the extent to which it believes its activities should or should not be subject to impact statements.[89] EPA's study, and the forthcoming decisions on Government appeal of the *Kalur* and *Sierra Club* cases, should clarify NEPA's requirements in this area. Meanwhile, the Council and EPA have recommended to the Congress a temporary moratorium in applying section 102(2)(C) to the Refuse Act permit program.[90] This would allow rapid processing of the initial backlog of over 20,000 permit applications on existing facilities. Permits issued during the moratorium would be subject to arrangements developed for handling future applications.

formal regulatory procedures—Many Federal regulatory agencies must base their actions on the record of a hearing at which concerned parties are permitted to present facts and arguments.[91] The procedures applicable to most such agencies are spelled out in the Administrative Procedure Act (APA)[92] and are often further elaborated in the agencies' own statutes. Difficulties have arisen in accommodating these procedures to the requirement in section 102(2)(C) that the environmental impact statement "accompany the proposal through the existing agency review processes."

The procedures of the FPC illustrate the difficulty. If an application is made to the FPC for a certificate to construct a hydroelectric power facility, and the application is opposed by an intervenor, a hearing is held at which the opposing views are aired. Each party at the hearing is entitled to confront and cross-examine the opposing witnesses. The hearing examiner then makes an initial decision and, if that is challenged, the Commission itself makes a final ruling.

The rules adopted by the FPC to implement NEPA require the applicant to submit with his application a report containing enough information to be the basis for a 102 statement. Rather than writing a draft statement prior to the hearing, the agency staff, under the FPC rules, circulates the applicant's report as the basis for comments from other agencies and discussion at the hearing. The FPC takes the position that the APA makes it preferable for its staff not to take positions on the environmental issues prior to the hearing. After the hearing, the FPC staff prepares a brief which includes the elements of a draft 102 statement. The parties in the proceeding get the brief, but there is no agency draft statement circulated to other agencies and to the public for comment. The hearing examiner considers the briefs of the staff and the parties and issues his initial decision. His decision is explained in an opinion that includes a final 102 statement. If Commission review is sought, the Commission may revise the final 102 statement in its own opinion.

The FPC procedures have been attacked by environmentalists as inconsistent with NEPA on two grounds: first, that by failing to require a draft statement prior to the hearing, they ignore NEPA's requirement that a statement accompany the proposal through the existing agency review processes; and second, that the failure to circulate the staff draft statement to any agencies not involved in the proceeding violates NEPA's requirement to obtain comments of expert agencies.

In *Greene County Plannning Board* v. *FPC*,[93] involving a challenge to the FPC's authorization of a transmission line to connect with a powerplant in Gilboa, N.Y., a U.S. court of appeals agreed with the first of these arguments. The court held that the FPC has "abdicated a significant part of its responsibility by substituting the [draft] statement of [the applicant] for its own" as the only document available prior to the hearing. Considering the FPC's hearing "an existing review process," the court said that NEPA would be satisfied only if "the agency's *own*" draft statement was prepared for the parties to see before the hearing. The court said that circulation of the applicant's draft to other agencies satisfied NEPA's consultation requirement. But it indicated that it would be preferable for the FPC to circulate its own draft, as the AEC does in similar formal licensing proceedings.[94]

In response to the claim that the APA requires the agency staff to refrain from taking a position prior to the hearing, the court held that the APA prevents only premature decisions by the Commission members but does not prevent release of a draft statement prepared by the agency staff without participation by the Commission members.[95] The court also held that parties opposing the application must be given the opportunity at the hearing to cross-examine the applicant and the FPC staff about the draft statement. The FPC is seeking review of the *Greene County* decision in the Supreme Court.

content of impact statements

Section 102(2)(C) specifies that environmental impact statements must cover five points:

> (i) the environmental impact of the proposed action,
> (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
> (iii) alternatives to the proposed action,
> (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
> (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.[96]

Section 6 of the Council's guidelines elaborates on these requirements. Early court decisions confirmed beyond doubt that together they are intended to bring "full disclosure" of the environmental implications of an impending decision.[97] An impact statement must discuss "all known *possible* environmental consequences of proposed agency action." [98] Only then can it serve its purpose—to help the agency to decide and to fully inform the public, the President, and the Congress on the issues.

Implementing the 102 process has raised a number of questions about the required content of impact statements. Out of this questioning have come three decisions by the U.S. Court of Appeals for the District of Columbia, which give added guidance in this important area.

duty to consider opposing views—The statement prepared by the AEC for the "Cannikin" underground nuclear test on the island of Amchitka in autumn 1971 was challenged in court. The plaintiffs argued that the AEC statement failed to discuss the views of experts who disagreed with the AEC's scientists about the possible dangers from the test. The courts never finally ruled on the adequacy of the AEC statement, because the case was mooted by the actual performance of the test. But the litigation produced a major opinion defining the duty to discuss opposing views under NEPA. In *Committee for Nuclear Responsibility* v. *Seaborg*,[99] the U.S. Court of Appeals for the District of Columbia held that a 102 statement must inform "the officials making the ultimate decision . . . of the full range of responsible opinion on the environmental effects" of the proposal. A statement must therefore "set forth the opposing views" on significant environmental issues raised by the proposal. The court stressed that it would be "arbitrary and impermissible" to omit from a statement "any reference whatever to the existence of responsible scientific opinion" on such issues. It noted, however, that "only responsible opposing views need to be included" and that "the agency need not set forth at full length views with which it disagrees." What is required is "a meaningful reference that identifies the problem at hand for the responsible official." [100]

Taken together, the requirement that a draft statement be circulated for comment and the requirement to discuss opposing views make the 102 statement a very effective way to meld the best knowledge on environmental issues. The initiating agency should, of course, consider all major schools of thought in its draft statement. If there are responsible opinions of which the agency is unaware, they can be brought out in comments on the draft. This enables the agency to reevaluate the project in light of the comments and to discuss them in the final statement.

duty to discuss alternatives—As noted above, the Interior Department was challenged under NEPA when it proposed a sale of oil and gas leases on the Outer Continental Shelf as one implementing step under the President's Energy Message. In *Natural Resources Defense Council* v. *Morton*,[101] the Court of Appeals for the District of Columbia held that Interior's 102 statement contained an inadequate discussion of alternative courses of action. The court's opinion reaffirmed the importance of the duty to discuss alternatives and examined the scope of the duty.

The court noted that the terse language in section 102(2)(C) on alternatives had been explained in the Senate as requiring a discussion of "the alternative ways of accomplishing the objectives of the proposed action and the results of not accomplishing the proposed action." [102] It also noted that this requirement in turn is buttressed by the requirement of section 102(2)(D) that an agency

> study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.[103]

The court, quoting the Council's guidelines, said that these provisions require not only a "rigorous exploration" and description of alternative courses of action but also "an analysis . . . of their costs and impact on the environment." [104]

The Government argued that the only alternatives to which this requirement applies are those that can be adopted and put into effect by the official or agency issuing the statement. Many of the possible alternative ways of producing the energy that Interior proposed to tap from the Outer Continental Shelf were within the province of agencies other than Interior. So defending lawyers argued that Interior was not required to discuss them. The court rejected this as inconsistent with the Congress' purpose in section 102(2)(C) to institute "a comprehensive approach to environmental management." The court declared that "it is the essence and thrust of NEPA that the pertinent statement serve to gather in one place a discussion of the relative environmental impact of alternatives"—including all the alternatives reasonably available to the Government as a whole. Even if some of those alternatives are outside the authority of the agency preparing the statement, their discussion will inform the public on the issues and guide the future choices of the ultimate decisionmakers in the Federal Government—the President and the Congress. The court noted that the importance of this broad discussion of alternatives was highlighted in the case before it—in which the proposed action was part of a broad governmental plan to deal with the energy problem, yet the major policy tradeoffs had not been discussed in an overview statement on the entire plan.

However, the court stressed that it was not asking the impossible in a discussion of alternatives. It observed that "[a] rule of reason is implicit in this aspect of the law, as it is in the requirement that the agency provide a statement concerning the opposing views that are responsible." [105] What NEPA requires is "information sufficient to permit a reasoned choice of alternatives so far as environmental aspects are concerned." [106] If an alternative has little or no effect on the environment, the environmental impact statement may simply state that that is the case. A course of action promising results only in the distant future need not be discussed as an alternative to a proposal designed to deal with a short-term problem. Detailed discussion is not required of alternatives that "are deemed only remote and speculative possibilities, in view of basic changes required in statutes and policies of other agencies." And the agencies need not indulge in " 'crystal ball' inquiry" in assessing the effects of alternatives. The agency will have taken the "hard look" demanded by NEPA if it has discussed the reasonably foreseeable impacts with a thoroughness commensurate with their severity and the significance of the action.[107]

"balancing" opposing considerations—Agencies have public values to consider other than just the environment. Balancing them against environmental values is inherent in the duty imposed by NEPA. If the environmental effects are adverse, the agency must consider whether they outweigh the benefits of the proposal. This implicit requirement is confirmed by the directive of section 102(2)(B) that agencies develop methods for giving "presently unquantified environmental amenities and values . . . appropriate consideration in decisionmaking along with economic and technical considerations." [108]

However, NEPA is less clear on whether this balancing of environmental against other values must be spelled out in the environmental impact statement. Each of the five items expressly required of statements under section 102(2)(C) relates to environmental effects—except the third, which does not specify what type of information is necessary about "alternatives to the proposed action." It is not wholly clear from the bare language of section 102(2)(C) whether the 102 statement is to catalog only the environmental effects of the proposed action and alternatives or whether it is to identify all of the important values bearing on the wisdom of the proposed action. Is it to state the various opposing considerations which enter into the agency's decision?

The legislative history suggests that the Congress did expect the 102 statement to record the agency's tradeoffs of competing values. In explaining the bill on the Senate floor, Senator Jackson said:

> Subsection 102(c) [now 102(2)(C)] establishes a procedure designed to insure that in instances where a proposed major Federal action would have a significant impact on the environment that the impact has in fact been considered, *that any adverse effects which cannot be avoided are justified by some other stated consideration of national policy,* that short-term uses are consistent with long-term productivity, *and that any irreversible and irretrievable commitments of resources are warranted.* (Emphasis added.)[109]

This interpretation is supported by several statements in court decisions. In the *Calvert Cliffs'* case, the court stressed the necessity for balancing under NEPA. And it interpreted the role of the 102 statement in showing how the balancing was done:

> In some instances environmental costs may outweigh economic and technical benefits and in other instances they may not. But NEPA mandates a rather finely tuned and "systematic" balancing analysis in each instance.
>
> To ensure that the balancing analysis is carried out and given full effect, section 102(2)(C) requires that responsible officials of all agencies prepare a "detailed statement" covering the impact of particular actions on the environment, the environmental costs which might be avoided, and alternative measures which might alter the cost-benefit equation.[110]

Similarly, in *Natural Resources Defense Council* v. *Morton,* the court observed that:

> The impact statement provides a basis for (a) evaluation of the benefits of the proposed project in light of its environmental risks, and (b) comparison of the net balance for the proposed project with the environmental risks presented by alternative courses of action.[111]

This requirement to identify countervailing interests complements the primary purpose of the 102 statement: to assess the environmental effects of possible actions. NEPA was enacted out of a concern that environmental considerations were not being fully assessed before action was taken. When an agency proposes to go ahead despite adverse environmental consequences, the 102 statement must identify the other interests that justify going ahead. Of course, NEPA's purposes would not be served if the statement were to deteriorate into a promotional document in favor of the proposal, at the expense of a thorough and rigorous analysis of environmental risks. Moreover, it may be impossible and unnecessary to discuss the countervailing interests in the same detail as environmental factors. The court in the *Morton* case observed that "the consideration of pertinent alternatives requires a weighing of numerous matters, such as economics, foreign relations, [and] national security." [112] A detailed discussion of each of these subjects could require as much space as the environmental analysis itself, destroying the focus of the 102 statement and going beyond the purpose of the Act. What is necessary is a succinct recital of the interests being balanced, which will alert the President, the Congress, and the public to the nature of the interests which are being served at the expense of environmental values.

the role of the council on environmental quality

NEPA requires that each 102 statement be made available to the President, to the Council on Environmental Quality, and to the public.[113] Since the Council is designated by title II of NEPA as environmental advisor to the President, the guidelines say that supplying a 102 statement to the Council satisfies the obligation to make it available to the President.[114] But there is nothing in the Act specifying what the Council is to do with the 102 statements that it receives.

Two important constraints help to define the Council's role in the 102 process. First, NEPA does not transfer to the Council the responsibility to make each of the many Government decisions that significantly affect the environment. That responsibility remains in the Federal officials who administer the programs and who, as the responsible officials under NEPA,[115] must prepare environmental impact statements. Thus, the Council has no legal veto power over agency proposals. However, it does perform an important advisory role with the agencies and the President. Of course, the decisions of the heads of executive agencies are subject to review by the President as Chief Executive.

Second, NEPA establishes the Council in the Executive Office of the President as a small policymaking and coordinating group, not as another large addition to the Federal bureaucracy. With a total staff of less than 60, the Council cannot make a thorough study, even for advisory purposes, of every 102 statement filed with it.

Within these limitations, the Council plays a key role in the 102 process. Under Executive Order 11514, the Council is charged with issuing guidelines to Federal agencies for implementing section 102(2)(C).[116] Through this guideline mechanism, through assistance to agencies in preparing their own procedures for implementing NEPA, and through continuing consultation with agencies on their performance, the Council attempts to help agencies build NEPA's policy objectives into their decisionmaking apparatus. The Council believes that the consideration of environmental factors will be most effective if it comes in the early stages of program and project formulation. If the 102 process is not closely integrated at this early point, it risks becoming an overlay upon agency decisionmaking. And it tends to serve as a post facto justification of decisions based on traditional and narrow grounds. The Council's success in winning its objectives hinges largely upon its ability, through the review of section 102 statements and agency 102 procedures, to identify and pursue environmental issues.

The Council also attempts to use the 102 process to identify significant recurring substantive problems that point to a need for general reform of a Federal program through administrative action, Presidential order, or legislation. The interests protected by NEPA include not only pollution control and land use but many other aspects of the quality of life which are beyond the expertise of any single operating agency. So the Council plays an essential role in coordinating Government actions affecting those interests. Where the 102 process reveals a need for more comprehensive Government policies or programs, the Council can guide policy formulation and program development.

The 102 process also alerts the Council to the very significant projects whose environmental effects warrant careful Council review. After reviewing the 102 statement, the Council may advise the initiating agency or the President concerning the project.

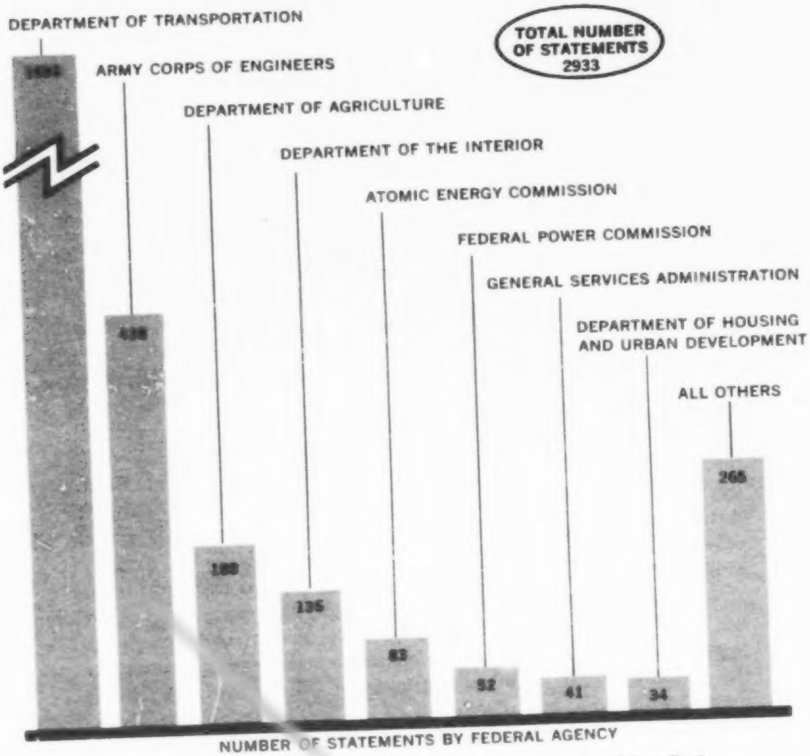
As of May 31, 1972, the Council had received draft or final impact statements on 2,933 agency actions. About half of these—1,552—are actions for which final statements have been filed and for which the 102 process is now complete. There are still 1,381 draft statements in process. In recent months, filings of finals and drafts combined have averaged about 10 each working day. Draft statements, which represent new proposals, are averaging about 4 to 5 each day—down from roughly 10 each day 8 months ago. The decrease primarily reflects a drop in the filings of highway 102's as State highway departments clear out their backlog of projects requiring NEPA analysis.

Despite this declining trend, transportation projects account for 60 percent of all actions for which 102 statements have been filed to date. Corps of Engineers projects make up about another 15 percent. This means that the remainder of the Federal establishment accounts for only 25 percent of the actions for which 102 statements have been filed. In nearly 2½ years since NEPA's enactment, fewer than 800 statements have been prepared for all categories of Federal actions other than highways, airports, and Corps activities. That is a rate of roughly 300 per year out of the thousands of Federal projects and actions initiated annually. These data imply that some agencies are not doing enough to define actions appropriate for 102 treatment and to prepare and submit environmental impact statements. In such cases the question is not whether the goals of NEPA are being implemented effectively but whether they are being implemented at all. The Council is concerned about this and is working closely with agencies to ensure broad compliance with the requirements of section 102(2)(C).

The Council's goal is to make the 102 process self-implementing, so that environmental factors will receive proper attention without needing frequent Council or court intervention. Public participation plays a vital role in realizing this goal by sounding an alert when an agency has failed to consider important environmental effects. Together, the Council, the public, and commenting agencies can help to realize NEPA's objective of making "environmental protection a part of the mandate of every Federal agency and department".[117]

Figure 1

Environmental Impact Statements Filed with the Council on Environmental Quality Through May 1972 by Agency *



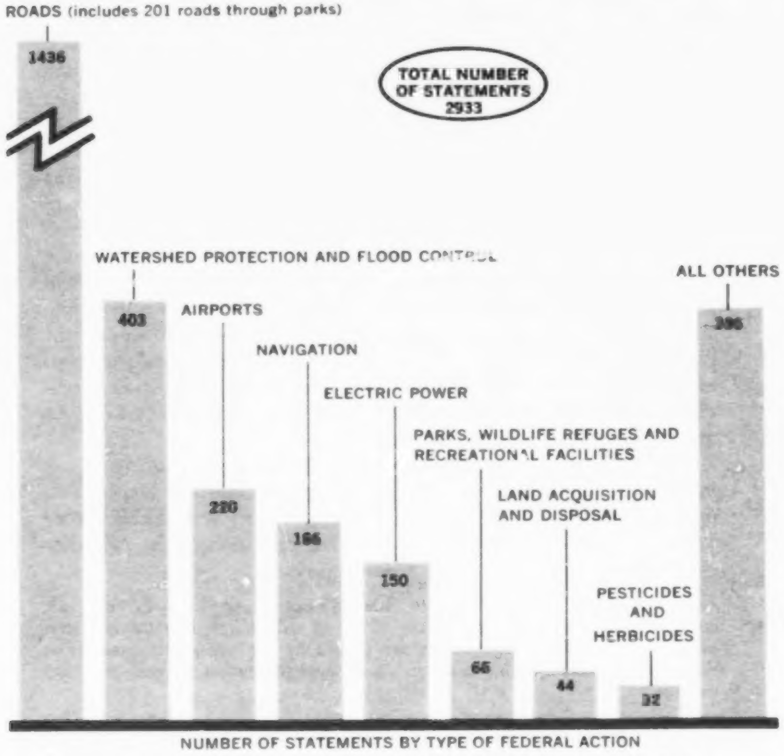
* Includes all final statements and draft statements for actions on which a final statement has not yet been filed.

the courts and nepa

Citizen enforcement of NEPA through court action has been one of the main forces in making the Act's intended reforms a reality. The Council's Second Annual Report chronicled the early cases brought under the Act and described the implications of this citizen enforcement.[118] The events of the past year indicate that citizen lawsuits continue to provide a check on agency compliance with NEPA and to resolve important questions about its interpretation.

Figure 2

Environmental Impact Statements Filed with the Council on Environmental Quality Through May 1972 by Type of Federal Action*



* includes all final statements and draft statements for actions on which a final statement has not yet been filed.

The lawsuits brought under NEPA since its enactment now number over 200. The bulk of them have involved federally assisted highway or airport projects, Corps of Engineers water resources projects, land management activities of the Interior or Agriculture Department, licenses for nuclear powerplants, and federally assisted housing projects. The litigation has spawned a number of major decisions, in which the courts not only have helped to interpret NEPA but also have more clearly defined their own role under the Act.

citizen standing—the mineral king decision

The law of citizen standing was reviewed in chapter 5 of the Council's Second Annual Report. In the succeeding year, court decisions have continued to confirm the right of citizens and citizen groups to invoke NEPA's protections when environmental values are threatened by an agency's failure to comply with the Act. Federal court decisions during the last year have upheld the "standing" of both individuals and public interest groups to sue under NEPA in diverse situations.[119] The Supreme Court decision in *Sierra Club* v. *Morton* (the *Mineral King* case),[120] which involved laws other than NEPA, frames new guidelines on the scope of citizen standing under all Federal laws protecting environmental values.

In the *Mineral King* case, the Sierra Club challenged the legality of a ski resort development on Federal land in the Mineral King Valley, which lies in the southern end of the Sierra Nevada Mountains in California. The Sierra Club argued that the proposed development violated Federal statutes governing the management of the National Forests and National Parks.[121] The Supreme Court held that the Sierra Club had not asserted a sufficient stake in the preservation of the Valley to have standing to bring the suit. However, the Court's opinion strongly confirmed the right of appropriate citizens and groups to sue to vindicate environmental interests. It also indicated what steps a group such as the Sierra Club must take to be able to bring such suits in the future.

The Supreme Court confirmed in clear language that an injury to a noneconomic interest such as "the scenery, natural and historic objects and wildlife" of the Mineral King Valley is a sufficient base for a suit under the general court review provision of the Administrative Procedure Act.[122] The Court said:

> Aesthetic and environmental well-being, like economic well-being, are important ingredients of the quality of life in our society, and the fact that particular environmental interests are shared by the many rather than the few does not make them less deserving of legal protection through the legal process.[123]

The Court observed, however, that "the impact of the proposed changes in the environment of Mineral King will not fall indiscriminately upon every citizen" but will be felt directly only by those who use the area. Therefore, only such users and organizations representing such users have sufficient threatened injury to aesthetic and recreational values to be entitled to challenge the development in a Federal court.

The Sierra Club did not assert that its activities or those of its members would be affected by the development. It merely relied on its institutional interest in protecting natural areas such as Mineral King. The Court held that the Club had not asserted a sufficient basis for suit. The Court pointed out that the Sierra Club was free to go back to the lower Federal courts to seek to amend its complaint to claim a more direct injury. The Club has since done so.

The Court emphasized that a citizen or group which establishes its standing to sue by showing a direct involvement with the environmental asset at stake, is not limited in court to asserting just its own interest in the matter. Such a plaintiff may also assert the interest of the general public in protecting the threatened environmental values. Therefore, the requirement that the person seeking review assert an injury to himself "does not . . . prevent any public interests from being protected through the judicial process." [124]

The Court in the *Mineral King* case did not address itself to another aspect of citizen standing: Who is entitled to sue when Federal action threatens legally protected environmental values enjoyed by the public as a whole, rather than by any particular user group? The values protected by Federal endangered species laws,[125] for example, seem to belong to all citizens of the United States. Moreover, in NEPA itself there is a declaration of policy to protect a broad range of environmental values for the benefit of "present and future generations of Americans." [126] When a Federal action challenged under NEPA is said to endanger the atmospheric conditions on which human life depends or the biological integrity of the oceans, the threatened injury would appear to affect all citizens. The *Mineral King* decision does not seem to foreclose recognizing the right of any responsible citizen or citizens' group to invoke the protections of Federal law in such cases.

The Government's brief to the Supreme Court in *Mineral King* acknowledged that NEPA may confer broader citizen standing than do the specific statutes involved in that case.[127] That argument is supported by the Court's statement that its ruling "does not insulate executive action from judicial review." [128]

Further decisions will be necessary to clarify the full consequences of the *Mineral King* opinion. But already it has banished any doubt that the environmental interests embodied in Federal statutes, such as NEPA, stand on a par with economic and other interests before the Federal courts. When Government action in violation of NEPA threatens environmental interests, injured citizens are entitled to seek judicial redress.

review of agency actions

The Congress addressed section 102(2)(C) to the agencies in the executive branch of the Federal Government. Those agencies must develop procedures for implementing the 102 process. They must prepare environmental impact statements, and they must take environmental values into account in administering their programs. Federal law contains basic principles governing the role of the courts in reviewing whether agencies have complied with such directives. Those principles, which are summarized in the Administrative Procedure Act,[129] generally tell the courts to decide for themselves any questions of law passed upon by the agency. The courts may substitute their own reading of the law if they believe the agency has erred. The Federal courts are the ultimate arbiters of questions of Federal law under the Constitution.

The principles of judicial review, however, prescribe greater deference when the courts review an agency's determination of fact or its exercise of discretion in administering a program entrusted to it by law. When agency decisions of this type are made without formal procedures, they can generally be reversed by the courts only if they are "arbitrary or capricious." When the decisions are required to be made on the basis of a formal hearing similar to a trial (as described earlier in this chapter), they must be allowed to stand if supported by "substantial evidence" in the record compiled by the agency. The Supreme Court decision in *Citizens to Preserve Overton Park* v. *Volpe,*[130] discussed in the Council's Second Annual Report, lays the ground rules for applying these principles in environmental cases. Recent lower court decisions further clarify how these principles will be applied under NEPA.

the need for an impact statement—In deciding whether a 102 statement is required for a proposed action, an agency has a double duty. It must interpret the statutory phrase "major Federal actions significantly affecting the quality of the human environment," and it must determine what the environmental effects of its proposed action will be. The interpretation of the statutory phrase is a question of law. The assessment of environmental effects is largely a question of fact.

In lawsuits that have challenged agency decisions not to prepare 102 statements, courts have been exercising their responsibility to determine for themselves the scope of the statutory language. Even while doing so, the courts have acknowledged their limited role in reviewing an agency's conclusions about what effects its action will have. If an agency neglects to consider important environmental effects, the courts will send the case back to the agency for a new look—but they do not do the factfinding for the agency.[131]

The courts therefore have upheld agency decisions that 102 statements were not required, under the circumstances of particular cases, for a military practice maneuver in Reid State Park in Maine,[132] for Federal approval of a lease of lands held by the Government in trust for Indians in New Mexico,[133] for erecting a Federal office building to house Corps of Engineers staff in Mobile, Ala.,[134] and for grants to assist construction of a 66-unit apartment project in Los Angeles and a lower income housing project in Houston.[135] They have held that 102 statements were required for a grant to assist construction of a college high-rise housing project in Portland, Oreg.,[136] for Interstate Commerce Commission approval of a temporary boost in railroad freight rates,[137] for Federal aid for widening a Wisconsin State highway,[138] and for a Soil Conservation Service project to channelize 66 miles of Chicod Creek in North Carolina.[139]

In the last two decisions, the courts stressed that when an agency's decision on the applicability of section 102(2)(C) is challenged in court,

> It is the court which must construe the statutory standards ("major" and "significantly affecting") and, having construed them, then apply them to the particular project, and decide whether the agency's failure [to prepare a statement] violated the congressional command.[140]

This pronouncement highlights the courts' important role in judging the scope of the statutory language. Where the language is applicable, section 102(2)(C) does not make the preparation of a statement discretionary; it "is a flat command to [the agency], to the fullest extent possible, to make a detailed statement."[141] Each determination of applicability, however, also involves an assessment of the facts about the particular project. A reading of the courts' opinions in these two cases indicates that they did not mean to deny that this basic factfinding job is for the agency, with limited court review. The opinions in the other cases recognize this traditional principle even more explicitly.[142]

the content of an impact statement—The courts have had a great impact in construing the provisions of section 102(2)(C) which define what an environmental impact statement must contain. As described above, the courts have answered important questions about the agencies' duty to discuss opposing views, to consider all reasonable alternatives, and to disclose how competing interests have been balanced. However, in this area, too, the courts have been quick to point out that their role is narrower when they move from construing the statute to reviewing the content of a particular 102 statement. On the latter subject, the courts' responsibility is "to determine whether the agencies involved have fully and in good faith followed the procedure contemplated by Congress".[143]

Because preparing an impact statement requires judgment and skills in a variety of disciplines, the courts have no precise standard against which to measure an agency's performance. They have acknowledged this by saying that the requirements for the content of 102 statements are subject to a "rule of reason." If a 102 statement covers each of the matters required by NEPA, a court is left only to decide whether the discussion is sufficient in depth and detail to allow the statement to fulfill its purpose—to inform the decisionmakers and the public. The courts are not in a position to second-guess the judgment of the agency on the details of writing the statement. As the Court of Appeals for the District of Columbia observed in *NRDC* v. *Morton:*

> In this as in other areas, the functions of the courts and agencies, rightly understood, are not in opposition but in collaboration, toward achievement of the end prescribed by Congress. So long as the officials and agencies have taken the "hard look" at environmental consequences mandated by Congress, the court does not seek to impose unreasonable extremes . . . .[144]

the agency's proposed action—NEPA commands firmly that an agency must, to the fullest extent possible, take environmental values into account. It must also prepare environmental impact statements for major actions significantly affecting the quality of the human environment. If an agency fails to do either, it can be ordered to comply by a court.[145] But neither NEPA's substantive duty nor its 102 process purports to dictate the agency's choice of a course of action in particular situations. The courts have uniformly said that, after an agency has considered environmental effects, its decision to act is subject to the limited judicial review afforded by the traditional arbitrary-or-capricious and substantial-evidence tests.

For example, the Court of Appeals for the District of Columbia has said that NEPA does not authorize a court "to interject itself within the area of discretion of the executive as to the choice of the action to be taken." [146] A court "probably cannot reverse a substantive decision on its merits . . . unless it be shown that the actual balance of costs and benefits that was struck was arbitrary or clearly gave insufficient weight to environmental values." [147] The Court of Appeals for the Second Circuit, reviewing the FPC's license for the controversial Storm King powerplant on the Hudson River, agreed:

> The licensing of projects such as the Storm King plant and the evaluation of their environmental impact has been entrusted to "the informed judgment of the Commission, and not to the preferences of reviewing courts." [148]

The pronouncements of other courts are similar.[149]

The Supreme Court in *Citizens to Preserve Overton Park* v. *Volpe* [150] explained that the courts' role under the arbitrary-or-capricious test is to reverse an agency decision when there has been a clear error of judgment. The Court said that "this inquiry into the facts is to be searching and careful . . . [but] the court is not empowered to substitute its judgment for that of the agency".[151]

a new type of case—industry as plaintiff under nepa

Since its enactment, NEPA has provided a basis for environmentalists to urge more attention by Federal agencies to environmental effects and to challenge in court agency actions not in compliance with the Act. However, private business groups that either benefit from Government programs or are subject to Federal regulation are beginning to seek protection in NEPA as well. They are invoking section 102(2)(C)'s requirement of careful Federal decisionmaking as a protection against what they believe to be inadequate consideration of their interests in Federal environmental decisions.

The first decision in a case of this type was *National Helium Corp.* v. *Morton*.[152] In it a company that had contracted to sell helium gas to the Federal Government challenged the Government's decision to stop purchasing the gas. The company had an obvious economic interest in preserving its business relationship with the Government. However, it sued the Government not on the basis of that interest but on the ground that, as a member of the public, it would be harmed by the environmental damage stemming from the Government's decision. The company claimed that if it ceased its operations, the helium from the gas field in which it was working, said to be the largest source of helium in the free world, would be irretrievably lost to the atmosphere. On the basis of this argument, the court held that canceling the contract was a Federal action on which a 102 statement was required. It enjoined the cancellation pending preparation of a statement. The Department of the Interior has prepared a draft statement.[153]

More cases of this type are likely as the Government imposes regulations to protect the environment and companies subject to the regulations seek to challenge them in court.

In at least three cases, representatives of the cement, chemicals, and electric power industries have challenged EPA's regulations limiting air pollution emissions from new industrial plants.[154] The companies argue that the regulations are major Federal actions that significantly affect the environment; therefore 102 statements are required. The success of that argument will depend on how the applicability of the 102 process to EPA's regulatory activities is resolved. But regardless of how it is resolved, businesses can be expected to challenge other regulatory actions of the Government.

There is a question in these cases whether the business plaintiff has standing to challenge a violation of NEPA. NEPA is intended to protect the quality of life, while the company generally is seeking to avoid a corporate financial injury unrelated to protection of environmental values. Federal law generally allows a person to sue only when the interest he asserts is an interest intended to be protected by the statute involved.[155] Companies may be able to show in some cases that their financial interests coincide with an environmental interest protected by NEPA. For example, a company might argue that strict controls on one kind of pollution, such as ocean dumping, would force some other means of waste disposal, leading to further pollution of the air or inland waters instead. When such a relationship exists, a company may claim to protect environmental values and its own business interests at the same time. It is too early to judge whether businesses will often succeed in establishing standing to invoke NEPA in this way.

With both environmental and business groups policing agency performance under section 102(2)(C), it is virtually certain that there will continue to be a substantial load of litigation under NEPA in the years ahead. This litigation should continue to exert a strong force in realizing the purposes of the Act.

conclusions—nepa's accomplishments

In the two and a half years since its enactment, NEPA has gone far toward fulfilling its promise as one of the major pieces of governmental reform legislation in decades. It has had at least five clearly beneficial effects on the Federal Government.

First, it is a major step in bringing national policies in line with modern concerns for the quality of life. For the first time, maintaining environmental quality is acknowledged to be "the continuing responsibility of the Federal Government."[156] Each agency has had its horizon broadened to include not only its own parochial concerns but also the need to "assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings."[157]

Second, the 102 process provides a systematic way for the Government to deal with complex problems that cut across the responsibilities of several agencies. Many of the modern problems faced by the Government are inherently complex and are beyond the responsibility of a single agency. In the past, different agencies have often responded to these problems in a piecemeal, uncoordinated fashion, largely because of the lack of a mechanism for shaping comprehensive policy. By forcing interagency consultation and attention to a broad range of effects and alternatives, section 102 fosters more sophisticated Government decisionmaking. The 102 process uncovers the need for more comprehensive policies and programs in areas such as energy and transportation. Thus it is a catalyst for more sensible policy formulation and program development.

Third, the 102 process has opened a broad range of Federal Government activities to public scrutiny and participation for the first time. Although many agency procedures were formerly closed, the agencies are now required to explain their decisions when significant environmental values are concerned. A written study of environmental effects, including an analysis of available alternatives, must be made available to the President, the Congress, and the public before an agency acts. The public in turn has an opportunity to evaluate and comment on the agency's analysis. This new element of public participation should contribute to more careful and conscientious decisionmaking.

Fourth, agencies whose personnel have reflected a narrow focus of concerns are being required now to supplement their staffs with persons of different backgrounds relevant to environmental issues. NEPA's required "interdisciplinary approach" means that personnel must be hired who bring not only new skills but a fresh viewpoint into the agencies. Over time, this influx should lead to sharper questioning of traditional assumptions within the agencies. Out of it should emerge an institutional viewpoint that is more sympathetic to environmental values.

Fifth, NEPA's initiatives are enforceable in Federal court by citizen suit. This keeps each of these requirements from being an empty exhortation. What NEPA requires of the agencies is often difficult and uncomfortable. It is only natural that agencies are sometimes reluctant to question accepted goals and to do the work demanded by the 102 process. The willingness of citizens to sue to vindicate NEPA and the vigilance of the courts in enforcing the Act help to ensure that the agencies take their new tasks seriously.[158]

NEPA has had a positive effect on Government decisions, although it is difficult to assess accurately the size of this impact. The examples already listed of projects and programs improved by NEPA provide little feel for NEPA's effect on the thousands of other decisions that make up the agencies' daily workload. The substantial number of impact statements filed with the Council is a sign that many agencies are responding to the Act. But the best indication available at this juncture is probably the subjective impressions of those who work with the agencies on environmental matters on a close, daily basis—the Congressional committees that oversee the Act, the environmental groups, the Council on Environmental Quality, and the Environmental Protection Agency. For its part, the Council's sustained contact with agency actions under NEPA leads it to believe that desirable changes are in fact underway in the Federal bureaucracy. There is still much room for improvement. Not all agencies are successfully identifying actions subject to 102 statements. Statements are sometimes prepared too late to have a real role in decisionmaking. Viewpoints and practices are changing more quickly in some agencies than others. But the Federal Government, at the deliberate pace characteristic of large institutions, is falling into step with the Nation's new environmental consciousness expressed in NEPA.

The General Accounting Office (GAO) recently completed a review for the House Merchant Marine and Fisheries Committee of the implementation of the 102 process by seven selected agencies: the Army Corps of Engineers, the Forest Service, the Soil Conservation Service, the Department of Housing and Urban Development, the Federal Aviation Administration, the Federal Highway Administration, and the Bureau of Reclamation.[159] In addition GAO analyzed the roles of the Council on Environmental Quality, EPA, and the Office of Management and Budget under the Act and called for intensified efforts in its enforcement. GAO found that the Government needs to improve its identification of projects needing 102 statements and to inject the preparation of statements earlier in the decisionmaking process. GAO also recommended that agencies supplement their NEPA procedures to ensure that measures to protect the environment are actually carried out and to improve other aspects of the 102 process. The GAO report will assist the Council and the agencies in making the 102 process more effective.

By requiring a thorough examination of environmental effects before the Government commits itself to a new course of action, NEPA supplies a needed mechanism for technology assessment. New technologies have been developed and used in the past usually without sufficient advance assessment of the broad range of environmental changes that they might bring. Now, when technological developments such as the supersonic transport and the fast-breeder nuclear reactor advance beyond research to the development stage, they must be subjected to searching analysis before implementation. Our ability to anticipate and thereby to control the environmental effects of technological change has been enhanced.

These benefits have not been without costs to the Government. The initial uncertainties about NEPA's meaning have spawned a large amount of litigation, which is always costly in money and time. As NEPA principles become clearer, this problem should decline. The need to study environmental effects and to hire new personnel carries budgetary costs. These costs may run as high as $65 million a year when NEPA is fully underway. However, much larger amounts can be wasted on any one ill-advised Federal project—for example, the Cross-Florida barge canal had cost $50 million when the President stopped it and would have cost $130 million more to complete. Moreover, careful analysis of the effects of Government action is a logical component of good public administration. Much of the cost attributed to NEPA is going for studies that should be performed in any event.

Private investment decisionmaking in many areas also has been touched by NEPA and the 102 process. Businesses subject to Federal regulation or which receive Federal funding are having to adjust to the agencies' new environmental awareness. Private planners for new power facilities, for federally assisted housing, and for development of the resources of Federal lands must now consider the environmental issues spelled out in section 102(2)(C). The costs to business have in some instances been substantial.

The States, too, have felt NEPA's impact. States that apply for Federal funding for projects such as highways, airports, and sewage treatment plants must anticipate the scrutiny their proposals will receive from Federal agencies. As a result, they are gathering more information on the environmental issues surrounding these projects.

NEPA's beneficial effects overlap into the international arena. Actions of the U.S. Government to which the 102 process applies often affect the environments of neighboring or even distant countries. Canada and Mexico are affected by Federal activities near their borders, and 102 statements must consider effects in those countries.[160] Possible effects on Japan and its environment were considered in impact statements on the removal of nerve gas from Okinawa to Johnson Island in the Pacific and the detonation of the Cannikin underground nuclear test on Amchitka Island in the Aleutian chain.[161] Moreover, the growing number of completed 102 statements provides an information source on a broad range of environmental issues that is freely available to other nations.

The success of the 102 process has prompted a committee of the National Academy of Sciences to suggest that the United Nations consider adopting a similar process to evaluate the environmental impacts of the actions of the U.N.'s specialized agencies. The international "102 statements" would be furnished to the new U.N. environmental agency recommended by the 1972 U.N. Conference on the Human Environment in Stockholm.[162]

The experiment in governmental reform begun by NEPA's passage is having steadily more wide-ranging ramifications. The Act's accomplishments to date are impressive. And there is every indication that its usefulness will increase in the coming years.

footnotes

1. H.R. 6750, 91st Cong., 1st Sess. (1969).
2. S. 1075, 91st Cong., 1st Sess. (1969).
3. See 115 Cong. Rec. 19008–13 (July 10, 1969) (Senate passage); *id.* at 26568–91 (Sept. 23, 1969) (House passage); *id.* at 3[illegible]-04 (Dec. 17, 1969) (conference report).
4. The full text of NEPA appears in Appendix B.
5. See S. Rep. No. 91–296, 91st Cong., 1st Sess. 10–12 (July 9, 1969); H.R. Rep. No. 91–378, 91st Cong., 1st Sess. 2-3 (July 11, 1969).
6. "America the Beautiful", An Address by Russell E. Train, President, Conservation Foundation, Before the 90th Annual Meeting of the American Forestry Association Held Jointly with the National Council of State Garden Clubs, Jackson Lake Lodge, Grand Teton National Park, Wyoming, Sept. 6, 1965 (reprinted by Conservation Foundation); see Terence T. Finn, Unpublished Doctoral Dissertation on NEPA Submitted to the Department of Government, Georgetown University (1972).
7. P.L. 304, ch. 33, 60 Stat. 23 (Feb. 20, 1946), *as amended,* 15 U.S.C. §§ 1021–24.
8. 15 U.S.C. § 1021.
9. See 15 U.S.C. §§ 1022, 1023.
10. See, *e.g.*, Baldwin, "The Santa Barbara Oil Spill," in *Law and the Environment*, p. 5 (M. Baldwin & J. Page eds. 1970); J. Sax, *Defending the Environment—A Strategy for Citizen Action*, pp. 240–42 (1971).
11. S. Rep. No. 91–296, 91st Cong., 1st Sess. 8 (July 9, 1969).
12. *E.g.*, Hearings on S. 1075, S. 237, and S. 1752 Before the Committee on Interior and Insular Affairs, United States Senate 112–35 (April 16, 1969) (Testimony of Prof. Lynton K. Caldwell).
13. 115 Cong. Rec. 19008–13.
14. 115 Cong. Rec. 26568–91.
15. 115 Cong. Rec. 29046–63, 29066–89.
16. 115 Cong. Rec. 40415–27 (Dec. 20, 1969); *id.* at 40923–28 (Dec. 23, 1969).
17. 16 U.S.C. § 803(a).
18. 354 F.2d 608, 620, 1 ERC 1084, 1092–93, 1 ELR 20292, 20296–97 (2d Cir.), *cert. denied,* 384 U.S. 941 (1965).
19. *Id.* at 620, 1 ERC at 1093, 1 ELR at 20297.
20. 387 U.S. 428, 1 ERC 1069, 1 ELR 20117 (1967).
21. 49 U.S.C. § 1653(f). See also Department of Transportation Act § 2(b)(2), 49 U.S.C. § 1651(b)(2).
22. 16 U.S.C. § 661 *et seq.*
23. 16 U.S.C. § 470 *et seq.*
24. See, *e.g., Environmental Defense Fund* v. *Corps of Engineers,* 325 F. Supp. 728, 739, 2 ERC 1260, 1263, 1 ELR 20130, 20134 (E.D. Ark. 1971).
25. See NEPA §§ 101(a), (b), 42 U.S.C. §§ 4331(a), (b).
26. See NEPA § 102(1), 42 U.S.C. § 4332(1); 115 Cong. Rec. 39703 (Dec. 17, 1969) (conference report) *id.* at 40418 (statement by Senator Jackson). See also *Ely* v. *Velde,* 451 F.2d 1130, 3 ERC 1280, 1 ELR 20612 (4th Cir. 1971); *Calvert Cliff's Coordinating Committee*

v. *AEC*, 449 F.2d 1109, 2 ERC 1779, 1 ELR 20346 (D.C. Cir. 1971); Peterson, "An Analysis of Title I of the National Environmental Policy Act of 1969", 1 ELR 50035 (1971).

27. NEPA §§ 102(2)(B), 103, 105, 42 U.S.C. §§ 4332(2)(B), 4333, 4335.
28. See, *e.g.*, *Zabel* v. *Tabb*, 430 F.2d 199, 1 ERC 1449, 1 ELR 20023 (5th Cir. 1970); *Calvert Cliffs' Coordinating Committee* v. *AEC*, 449 F.2d 1109, 2 ERC 1779, 1 ELR 20346 (D.C. Cir. 1971); *Natural Resources Defense Council* v. *Morton*, 3 ERC 1558, 2 ELR 20029 (D.C. Cir. 1972).
29. *Zabel* v. *Tabb*, *supra* note 28.
30. Department of Transportation, Environmental Impact Statement, Toll Bridge/San Francisco Bay from India Basin, San Francisco to Bay Farm Island and Alameda, Calif. (Draft, Jan. 10, 1971).
31. See *Students Challenging Regulatory Agency Procedures* v. *ICC* (D.D.C. July 10, 1972), *stay pending appeal denied* (Sup. Ct. July 19, 1972); Ex Parte Nos. 265 and 267, Increased Freight Rates, 1970 and 1971, 339 I.C.C. 125, 209 (1971); 37 *Fed. Reg.* 5202 (March 10, 1972). See generally 37 *Fed. Reg.* 6318 (March 28, 1972) (ICC NEPA procedures); *Port of New York Authority* v. *United States*, 451 F.2d 783, 3 ERC 1691, 2 ELR 20105 (2d Cir. 1971); *City of New York* v. *United States*, 337 F. Supp. 150, 3 ERC 1570, 2 ELR 20275 (E.D. N.Y. 1972).
32. Compare *New Hampshire* v. *AEC*, 406 F.2d 170, 1 ERC 1053 (1st Cir.), *cert. denied*, 395 U.S. 962 (1969), with *Calvert Cliffs' Coordinating Committee* v. *AEC*, 449 F.2d 1109, 2 ERC 1779, 1 ELR 20346 (D.C. Cir. 1971).
33. Statement by the President Terminating Construction of the Cross-Florida Barge Canal (Jan. 19, 1971), *reprinted in 7 Presidential Documents* 81 (Jan. 25, 1971).
34. Public Statement by Russell E. Train, Chairman, Council on Environmental Quality, and Kenneth E. BeLieu, Under Secretary, Department of the Army, "Recommendation for Future of the Oklawaha River Basin of the Cross-Florida Barge Canal Project" (May 18, 1972).
35. See note 30 *supra;* New York Times, Section 1, p. 64, col. 6 (June 11, 1972).
36. Department of Transportation, Environmental Impact Statement, Georgia, Cobb County I–75–3(2) 291 P.E. and I–75–3(3) 270 P.E. (Final, March 29, 1972).
37. Department of Transportation, Environmental Impact Statement, Fairfax County Airport Site (Draft, Jan. 7, 1971).
38. General Services Administration, Environmental Impact Statement, Disposal of Portion of Fort Snelling Hospital Reservation, Saint Paul, Minn. (Final, Aug. 20, 1971).
39. Department of Housing and Urban Development, Environmental Impact Statement, Proposed Park Forest South New Community, Will County, Ill. (Final, March 23, 1971).
40. Department of the Interior, Public Statement (Sept. 20, 1971).
41. Department of the Interior, Environmental Impact Statement, 1971 Outer Continental Shelf Oil and Gas Drainage Lease Sale—Offshore Louisiana, pp. 28–34, 36 (Final, Sept. 7, 1971); Department of the Interior, Public Statement (Nov. 22, 1971).
42. Forest Service, Emergency Directive No. 1 (Nov. 9, 1971), *reprinted in* Title 2100, Forest Service Manual.
43. See 33 C.F.R. §§ 209.120, 209.130, 209.150; Corps of Engineers Regulation 1145–2–303, Change 5 (April 23, 1970).
44. See 10 C.F.R. Part 50, Appendix D, as amended, 37 *Fed. Reg.* 9779 (May 17, 1972). See also 37 *Fed. Reg.* 10013 (May 18, 1972).
45. See Executive Order 11574 (Dec. 23, 1970); Executive Order 11644 (Feb. 8, 1972); Executive Order 11643 (Feb. 8, 1972).

46. See, *e.g.*, H. Friendly, *Benchmarks*, pp. 86–154 (1967), and authorities there cited.

47. *Calvert Cliffs' Coordinating Committee* v. *AEC*, 449 F. 2d 1109, 1113, 2 ERC 1779, 1781, 1 ELR 20346, 20348 (D.C. Cir. 1971).

48. 36 *Fed. Reg.* 13722 (July 23, 1971) (Interior Department proposed rules for exploitation of geothermal steam resources). See also, *e.g.*, Department of Housing and Urban Development, Departmental Circular No. 1390.2, "Noise Abatement and Control: Departmental Policy, Implementation Responsibilities, and Standards" (Aug. 4, 1971).

49. 499 F. 2d 1109, 2 ERC 1779, 1 ELR 20346 (D.C. Cir. 1971).

50. 33 U.S.C. 1151, *as amended by* P.L. 91–224, 84 Stat. 91 (April 3, 1970).

51. See 115 Cong. Rec. 29046–63 (Senate consideration of Water Quality Improvement Act of 1970); *id.* at 29066–89 (Senate discussion of position in conference committee on NEPA); *id.* at 40923–28 (House debate on conference report on NEPA); 116 Cong. Rec. 8984 (Senate debate on conference report on Water Quality Improvement Act). See also Comment, 1 ELR 10125, 10127 (1971).

52. *Calvert Cliffs' Coordinating Committee* v. *AEC*, 449 F. 2d 1109, 1123, 2 ERC 1779, 1788, 1 ELR 20346, 20353 (D.C. Cir. 1971).

53. See S. 2770, § 511(d) (as passed by Senate), § 511(c) (as passed by House), 92d Cong., 2d Sess.; 117 Cong. Rec. S17456 (Daily Ed. Nov. 2, 1971).

54. 42 U.S.C. § 4331(a).

55. 42 U.S.C. § 4344(4).

56. Executive Order 11514, § 3(a) (March 5, 1970), *reprinted in* 35 *Fed. Reg.* 4247 (March 7, 1970).

57. Message from the President of the United States Transmitting a Program to Save and Enhance the Environment, H.R. Doc. No. 92–46, 92d Cong., 1st Sess. (Feb. 8, 1971); Message from the President of the United States Transmitting a Program for Environmental Protection, H.R. Doc. No. 92–247, 92d Cong., 2d Sess. (Feb. 8, 1972).

58. Council on Environmental Quality, Guidelines for Statements on Proposed Actions Affecting the Environment, 36 *Fed. Reg.* 7724 (April 23, 1971) (hereinafter cited as *Guidelines*). The full text of the Guidelines appears in Appendix H.

59. See, *e.g.*, Council on Environmental Quality, "Memorandum for Agency and General Counsel Liaison on National Environmental Policy Act (NEPA) Matters" (May 16, 1972), *reprinted in* 3 *Env. Rep.* 82 (May 19, 1972).

60. See, *e.g.*, *Environmental Defense Fund* v. *Corps of Engineers*, 325 F. Supp. 728, 749, 2 ERC 1260, 1 ELR 20130 (E. D. Ark. 1971); *Environmental Defense Fund* v. *TVA*, 339 F. Supp. 806, 3 ERC 1553, 2 ELR 20044 (E.D. Tenn. 1972). See generally *Udall* v. *Tallman*, 380 U.S. 1, 16 (1965).

61. 42 U.S.C. § 4332(2)(C).

62. See cases cited in notes 131–139 *infra*, particularly *Natural Resources Defense Council* v. *Grant*, 3 ERC 1883, 2 ELR 20185 (E.D. N.C. 1972).

63. *Guidelines*, *supra* note 58, § 5, 36 *Fed. Reg.* 7724.

64. See 36 *Fed. Reg.* 23666 (Dec. 11, 1971). The full texts of these procedures are published and kept up-to-date in 1 ELR 46001 *et seq.*

65. See, *e.g.*, *Hanly* v. *Mitchell*, 4 ERC 1153, 1155, 2 ELR 20216, 20218 (2d Cir. 1972), *rev'g in part* — ERC ——, 2 ELR 20181 (S.D. N.Y. 1972).

66. See, *e.g.*, Department of Transportation Order DOT 5610.1A, § 8a (Oct. 4, 1971); *Hanly* v. *Mitchell*, *supra* note 65. See also *Citizens to Preserve Overton Park* v. *Volpe*, 401 U.S. 402 (1971).

67. See, *e.g.*, *Pennsylvania Environmental Council* v. *Bartlett*, 315 F. Supp. 238, 1 ERC 1271 (M.D. Pa. 1970), *aff'd*, 454 F.2d 613, 3 ERC

1421, 1 ELR 20622 (3d Cir. 1971); *Arlington Coalition on Transportation* v. *Volpe*, 332 F. Supp. 1218, 3 ERC 1138, 1 ELR 20486 (E.D. Va. 1971), *rev'd*, 3 ERC 1995, 2 ELR 20162 (4th Cir. 1972); *Brooks* v. *Volpe*, 319 F. Supp. 90, 329 F. Supp. 118, 2 ERC 1004, 1571, 1 ELR 20045, 20286 (W.D. Wash. 1970, 1971), *rev'd*, 3 ERC 1858, 2 ELR 20139 (9th Cir. 1972); *Elliott* v. *Volpe*, 328 F. Supp 831, 2 ERC 1498, 1 ELR 20243 (D. Mass. 1971). Cf. *Investment Syndicates, Inc.* v. *Richmond*, 318 F. Supp 1038, 1 ERC 1713, 1 ELR 20044 (D. Ore. 1970); *Citizens to Preserve Overton Park* v. *Volpe*, 335 F. Supp. 873, 3 ERC 1510, 2 ELR 20061 (W.D. Tenn. 1972). See also Comment, 1 ELR 10113, 10115 (1971); Peterson, *supra* note 26, at 50048.

68. See, *e.g.*, *Arlington Coalition on Transportation* v. *Volpe*, 3 ERC 1995, 2 ELR 20162 (4th Cir. 1972); *Brooks* v. *Volpe*, 3 ERC 1858, 2 ELR 20139 (9th Cir. 1972); *Lathan* v. *Volpe*, 455 F.2d 1111, 3 ERC 1352, 1 ELR 20602 (9th Cir. 1971); *Environmental Defense Fund* v. *Corps of Engineers*, 324 F. Supp. 878, 329 F. Supp. 543, 2 ERC 1173, 1797, 1 ELR 20079, 20366 (D. D.C. 1971); *Environmental Defense Fund* v. *TVA*, 339 F. Supp. 806, 3 ERC 1553, 2 ELR 20044 (E.D. Tenn. 1972); *Harrisburg Coalition Against Ruining the Environment* v. *Volpe*, 330 F. Supp. 918, 2 ERC 1671, 1 ELR 20237 (M.D. Pa. 1971); *Morningside-Lenox Park Assn.* v. *Volpe*, 334 F. Supp. 132, 3 ERC 1327, 1 ELR 20629 (N.D. Ga. 1971); *Sierra Club* v. *Laird*, 1 ELR 20085 (D. Ariz. 1970); *Texas Committee* v. *United States*, 1 ERC 1303 (W.D. Tex. 1970), *dismissed as moot*, 430 F.2d 1315 (5th Cir. 1970); *Willamette Heights Neighborhood Assn.* v. *Volpe*, 334 F. Supp. 990, 3 ERC 1520, 2 ELR 20043 (D. Ore. 1971); *Nolop* v. *Volpe*, 333 F. Supp. 1364, 3 ERC 1338, 1 ELR 20617 (D. S.D. 1971); *Conservation Society* v. *Volpe*, 4 ERC 1226, 2 ELR 20270 (D. Vt. 1972). But cf. *Jicarilla Apache Tribe* v. *Morton*, 3 ERC 1919, — ELR — (D. Ariz. 1972).

69. See *Izaak Walton League* v. *Schlesinger*, 337 F. Supp. 287, 3 ERC 1453, 2 ELR 20040 (D. D.C. 1971).

70. H.R. 13752 (passed by the House April 17, 1972).

71. See generally Comment, 2 ELR 10038 (April 1972); Comment, 2 ELR 10025 (March 1972).

72. Department of the Interior, Environmental Impact Statement, "Prototype" Oil Shale Leasing Program for the States of Colorado, Utah, and Wyoming (Draft, July 1, 1971); Department of the Interior, Environmental Impact Statement, Geothermal Leasing Program (Draft, Oct. 6, 1971; Supplemental Draft, May 8, 1971).

73. *Guidelines*, *supra* note 58, § 5(b), 36 *Fed. Reg.* 7724–25.

74. Cf. *National Resources Defense Council* v. *Morton*, 3 ERC 1558, 2 ELR 20029 (D.C. Cir. 1972); *Upper Pecos Assn.* v. *Stans*, 328 F. Supp. 332, 2 ERC 1614, 1 ELR 20228 (D. N.M. 1971), *aff'd*, 452 F.2d 1233, 3 ERC 1418, 2 ELR 20085 (10th Cir. 1971), *cert. granted*, 40 U.S.L.W. 3556 (May 22, 1972).

75. *Natural Resources Defense Council* v. *Morton*, *supra* note 74, 3 ERC 1562, 2 ELR 20033, *discussed in* Comment, 2 ELR 10038 (April 1972).

76. Atomic Energy Commission, Environmental Impact Statement, Liquid Metal Fast Breeder Reactor Demonstration Plant (Final, April 14, 1972). See also, *e.g.*, Department of the Interior, Environmental Impact Statement, Geothermal Leasing Program (Draft, Oct. 6, 1971; Supplemental Draft, May 8, 1971).

77. Arizona, California, Delaware, Hawaii, Indiana, Montana, New Mexico, North Carolina, Washington, and Wisconsin.

78. NEPA § 102(2)(C), 42 U.S.C. § 4332(2)(C).

79. *Guidelines*, *supra* note 58, § 6(a)(vii), 10(b), 36 *Fed. Reg.* 7725–26.

80. *Id.*, § 10(d), 36 *Fed. Reg.* 7726.

81. 42 U.S.C. § 1857h–7. See the extensive Comment on § 309 in 1 ELR 10146 (1971).
82. *Natural Resources Defense Council* v. *Morton,* 3 ERC 1623, 2 ELR 20071 (D. D.C. 1972).
83. 115 Cong. Rec. 40418 (Dec. 20, 1969).
84. See 115 Cong. Rec. 40423, 40425 (Dec. 20, 1969) (statement of Senator Muskie); 115 Cong. Rec. 40925, 40927–28 (Dec. 23, 1969) (statements of Representatives Dingell and Harsha).
85. 115 Cong. Rec. 40418 (Dec. 20, 1969).
86. *Guidelines, supra* note 58, § 5(d), 36 *Fed. Reg.* 7725.
87. *Kalur* v. *Resor*, 335 F. Supp. 1, 3 ERC 1458, 1 ELR 20637 (D. D.C. 1971); *Sierra Club* v. *Sargent*, 3 ERC 1905, 2 ELR 20131 (W.D. Wash. 1972). Both decisions have been appealed. Compare *Businessmen for the Public Interest* v. *Resor*, 3 ERC 1216 (N.D. Ill. 1971).
88. See notes 152–53 *infra* and accompanying text.
89. See Statement of William D. Ruckelshaus, Administrator, Environmental Protection Agency, Before the Senate Committees on Public Works and Interior and Insular Affairs (March 9, 1972); Statement of Russell E. Train, Chairman, Council on Environmental Quality, Before the House Subcommittee on Fisheries and Wildlife Conservation (March 22, 1972) (testimony on H.R. 13752).
90. See 118 Cong. Rec. H2577–78 (Daily Ed. March 27, 1972) (introduction of H.R. 14103); *id.* at S9809 (Daily Ed. June 21, 1972) (introduction of S. 3733); Statement of Timothy Atkeson, General Counsel, Council on Environmental Quality, Before the House Subcommittee on Fisheries and Wildlife Conservation (May 2, 1972).
91. See, *e.g.*, Atomic Energy Act § 189, *as amended*, 42 U.S.C. § 2239.
92. Administrative Procedure Act §§ 1–9, *as amended*, 5 U.S.C. §§ 551–59.
93. 455 F. 2d 412, 3 ERC 1595, 2 ELR 20017 (2d Cir. 1972), *petition for cert. filed*, 40 U.S.L.W. 3589 (No. 71–1597, June 6, 1972). See also *Students Challenging Regulatory Agency Procedures* v. *ICC* (D. D.C. July 10, 1972), *stay pending appeal denied* (Sup. Ct. July 19, 1972).
94. *Id.* at 420, 421, 422, 3 ERC at 1599, 1601, 2 ELR at 20020, 20021 (emphasis in original).
95. *Id.*; see Comment, 1 ELR 10022, 10027 (1971).
96. 42 U.S.C. § 4332(2)(C).
97. See, *e.g.*, *Environmental Defense Fund* v. *Corps of Engineers*, 325 F. Supp. 728, 749, 2 ERC 1260, 1 ELR 20130 (E.D. Ark. 1971); *Environmental Defense Fund* v. *Hardin*, 325 F. Supp. 1401, 2 ERC 1425, 1 ELR 20207 (D. D.C. 1971).
98. *Environmental Defense Fund* v. *Corps of Engineers, supra* note 97, 325 F. Supp. at 759, 2 ERC at 1267, 1 ELR at 20141 (emphasis in original).
99. 3 ERC 1126, 1 ELR 20469 (D.C. Cir. 1971). Subsequent opinions in the same case are reported at 3 ERC 1210, 1256, 1 ELR 20529, 20532 (D.C. Cir. 1971); 404 U.S. 917, 3 ERC 1276, 1 ELR 20534 (1971). See also Comment, 1 ELR 10161 (1971).
100. 3 ERC at 1128, 1129, 1 ELR at 20470 (emphasis in original).
101. 3 ERC 1558, 2 ELR 20029 (D.C. Cir. 1972), *discussed in* Comment, 2 ELR 10038 (April 1972).
102. 3 ERC at 1561, 2 ELR at 20032, *quoting* 115 Cong. Rec. 40420 (Dec. 20, 1969) (explanation by Senator Jackson of bill as approved by conference committee).
103. 42 U.S.C. § 4332(2)(D), *quoted in* 3 ERC at 1561, 2 ELR at 20032.
104. 3 ERC at 1561 n. 12, 2 ELR at 20032 n. 12, *quoting Guidelines, supra* note 58, 6(a)(iv), 36 *Fed. Reg.* 7725.
105. 3 ERC at 1561, 2 ELR at 20032.
106. 3 ERC at 1563, 2 ELR at 20033.
107. 3 ERC at 1558, 1564, 2 ELR at 20029, 20034.

108. 42 U.S.C. § 4332(2)(B).
109. 115 Cong. Rec. 29055 (Oct. 8, 1969) (explanation of position to be taken by Senate conferees in conference committee.)
110. *Calvert Cliffs' Coordinating Committee* v. *AEC,* 449 F. 2d 1109, 1113–14, 2 ERC 1779, 1781–82, 1 ELR 20346, 20348 (D.C. Cir. 1971). See also Comment, 2 ELR 10003 (Jan. 1972).
111. 3 ERC 1558, 1561, 2 ELR 20029, 20032 (D.C. Cir. 1972).
112. *Id.*
113. NEPA § 102(2)(C), 42 U.S.C. § 4332(2)(C).
114. *Guidelines, supra* note 58, § 10(b), 36 *Fed. Reg.* 7726.
115. NEPA § 102(2)(C), 42 U.S.C. § 4332(2)(C).
116. Executive Order 11514, § 3(h) (March 5, 1970).
117. *Calvert Cliffs' Coordinating Committee* v. *AEC,* 449 F. 2d 1109, 1112, 2 ERC 1779, 1780, 1 ELR 20346, 20347 (D.C. Cir. 1971).
118. Council on Environmental Quality, *Environmental Quality: Second Annual Report*, pp. 155–58, 163–70 (1971).
119. *E.g., National Helium Corp.* v. *Morton*, 455 F. 2d 650, 3 ERC 1129, 1 ELR 20478 (10th Cir. 1971), *aff'g* 326 F. Supp. 151, 2 ERC 1372, 1 ELR 20157 (D. Kan. 1971); *Natural Resources Defense Council* v. *Grant,* 3 ERC 1883, 2 ELR 20185 (E.D. N.C. 1972).
120. 40 U.S.L.W. 4397, 3 ERC 2039, 2 ELR 20192 (1972).
121. See statutes cited in 40 U.S.L.W. at 4398 n. 2, 3 ERC at 2040 n. 2, 2 ELR at 20193 n. 2.
122. 40 U.S.L.W. at 4399–400, 3 ERC at 2042, 2 ELR at 20194.
123. *Id.*
124. *Id.* at 4401, 3 ERC at 2044, 2 ELR at 20195.
125. See, *e.g.,* Endangered Species Conservation Act of 1969, 16 U.S.C. §§ 668aa to 668cc–5; Bald Eagle Protection Act, *as amended,* 16 U.S.C. §§ 668, 668a–668d.
126. NEPA § 101(a), 42 U.S.C. § 4331(a).
127. Brief for the United States at 29–30, *Sierra Club* v. *Morton* (U.S. Supp. Ct., No. 70–34).
128. 40 U.S.L.W. at 4401, 3 ERC at 2044, 2 ELR at 20195; see Comment, 2 ELR 10034 (April 1972). See also *Environmental Defense Fund* v. *EPA,* 2 ELR 20228 n. 1 (D.C. Cir. 1972).
129. See 5 U.S.C. § 706.
130. *Citizens to Preserve Overton Park* v. *Volpe,* 401 U.S. 402 (1971), *discussed in* Council on Environmental Quality, *Environmental Quality: Second Annual Report, supra note* 118, pp. 158, 168–69.
131. *Hanly* v. *Mitchell,* — ERC ——, 2 ELR 20181 (S.D. N.Y.) *rev'd in part and remanded,* 4 ERC 1153, 2 ELR 20216 (2d Cir. 1972).
132. *Citizens for Reid State Park* v. *Laird,* 336 F. Supp. 783, 3 ERC 1580, 2 ELR 20122 (D. Me. 1972).
133. *Davis* v. *Morton,* 335 F. Supp. 1258, 3 ERC 1546, 2 ELR 20003 (D. N. Mex. 1971)
134. *Save Our Ten Acres* v. *Kreger,* — ERC ——, — ELR —— (S.D. Ala. 1972).
135. *Echo Park Residents Comm.* v. *Romney,* 3 ERC 1255, — ELR —— (C.D. Cal. 1971); *Hiram Clarke Civic Club* v. *Romney,* — ERC ——, — ELR —— (S.D. Tex. 1971).
136. *Goose Hollow Foothills League* v. *Romney,* 334 F. Supp. 877, 3 ERC 1087, 1 ELR 20492 (D. Ore. 1971).
137. *Students Challenging Regulatory Agency Procedures* v. *ICC* (D. D.C. July 10, 1972), *stay pending appeal denied* (Sup. Ct. July 19, 1972).
138. *Scherr* v. *Volpe,* 336 F. Supp. 882, 886, 3 ERC 1586, 1588, 2 ELR 20068, 20069 (W.D. Wis. 1971).
139. *Natural Resources Defense Council* v. *Grant,* 3 ERC 1883, 2 ELR 20185 (E.D. N.C. 1972).

140. *Scherr* v. *Volpe,* 336 F. Supp. 832, 888, 3 ERC 1586, 1590, 2 ELR 20068, 20070 (W.D. Wis. 1971); see *Natural Resources Defense Council* v. *Grant, supra* note 139, at 1890, 2 ELR at 20189.

141. *Scherr* v. *Volpe, supra* note 140, at 888, 3 ERC at 1590, 2 ELR at 20070.

142. See, *e.g., Citizens for Reid State Park* v. *Laird,* 336 F. Supp. 783, 789, 3 ERC 1580, 1584, 2 ELR 20122, 20125 (D. Me. 1972); *Save Our Ten Acres* v. *Kreger,* — ERC ——, — ELR —— (S.D. Ala. 1972); *Goose Hollow Foothills League* v. *Romney,* 334 F. Supp. 877, 3 ERC 1087, 1 ELR 20492 (D. Ore. 1971); *Hanly* v. *Mitchell,* — ERC ——, 2 ELR 20181 (S.D. N.Y.), *rev'd in part and remanded,* 4 ERC 1153, 2 ELR 20216 (2d Cir. 1972); *Echo Park Residents Comm.* v. *Romney,* 3 ERC 1255, — ELR —— (C.D. Cal. 1971).

143. *Committee for Nuclear Responsibility* v. *Seaborg,* 3 ERC 1126, 1128, 1 ELR 20469, 20470 (D.C. Cir. 1971). See *Environmental Defense Fund* v. *Corps of Engineers,* 4 ERC 1097, — ELR —— (E.D. Ark. 1972).

144. *Natural Resources Defense Council* v. *Morton,* 3 ERC 1558, 1564, 2 ELR 20029, 20034 (D.C. Cir. 1972).

145. *E.g., Calvert Cliffs' Coordinating Committee* v. *AEC,* 449 F. 2d 1109, 1115, 2 ERC 1779, 1783, 1 ELR 20346, 20349 (D.C. Cir. 1971).

146. *Natural Resources Defense Council* v. *Morton,* 3 ERC 1558, 1564, 2 ELR 20029, 20034 (D.C. Cir. 1972).

147. *Calvert Cliffs' Coordinating Committee* v. *AEC,* 449 F. 2d. 1109, 1115, 2 ERC 1779, 1783, 1 ELR 20346, 20349 (D.C. Cir. 1971).

148. *Scenic Hudson Preservation Conference* v. *FPC,* 453 F. 2d 463, 467, 3 ERC 1232, 1235, 1 ELR 20496, 20498 (2d Cir. 1971), *cert. denied,* 40 U.S.L.W. 3599 (June 19, 1972).

149. *E.g., Environmental Defense Fund* v. *Corps of Engineers,* 2 ERC 1260, 1261, 1 ELR 20130, 20138 (E.D. Ark. 1971); *Hanly* v. *Mitchell,* 4 ERC 1153, 2 ELR 20126 (2d Cir.), *rev'g in part* — ERC ——. 2 ELR 20181 (S.D. N.Y. 1972). See also S. Rep. No. 91–296, 91st Cong., 1st Sess. 20 (1969).

150. 401 U.S. 402, 2 ERC 1250, 1 ELR 20110 (1971).

151. 401 U.S. at 416, 2 ERC at 1256, 1 ELR at 20113–14. See also *Environmental Defense Fund* v. *Ruckelshaus,* 439 F. 2d 584, 2 ERC 1114, 1 ELR 20059 (D.C. Cir. 1971).

152. 326 F. Supp. 151, 2 ERC 1372, 1 ELR 20157 (D. Kan. 1971), *aff'd,* 455 F. 2d 650, 3 ERC 1129, 1 ELR 20478 (10th Cir. 1971).

153. Department of the Interior, Environmental Impact Statement, Termination of Helium Purchase Contracts with National Helium Corp., Cities Services Helex, Inc., and Phillips Petroleum Co. (Draft, May 19, 1972).

154. *Essex Chemical Corp.* v. *EPA* (D.C. Cir. No. 72–1072, filed Jan. 21, 1972); *Portland Cement Assn.* v. *EPA* (D.C. Cir. No. 72–1073, filed Jan. 21, 1972); *Appalachian Power Co.* v. *EPA* (D.C. Cir. No. 72–1079, filed Jan. 24, 1972).

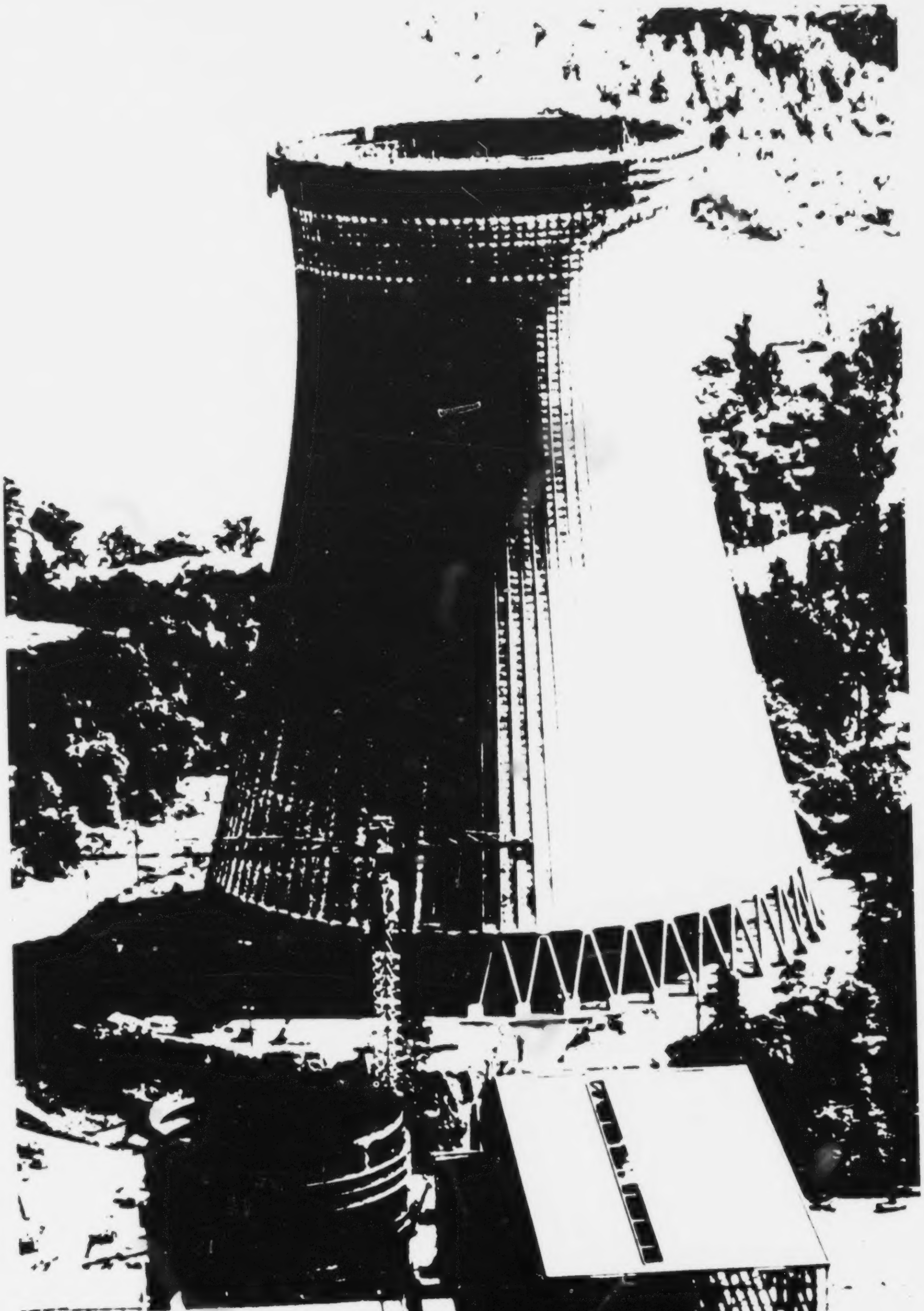
155. See *Association of Data Processing Service Organizations* v. *Camp,* 397 U.S. 150 (1970); *Sierra Club* v. *Morton,* 40 U.S.L.W. 4397, 4399, 3 ERC 2039, 2041, 2 ELR 20192, 20193–94 (1972); *Zlotnick* v. *Redevelopment Land Agency,* 2 ELR 20235 (D.D.C. 1972). Cf. *Pizitz* v. *Volpe,* 4 ERC 1195 (M.D. Ala. 1972).

156. NEPA § 101(b), 42 U.S.C. § 4331(b).

157. NEPA § 101(b)(2), 42 U.S.C. § 4331(b)(2).

158. See also Statement of Roger C. Cramton, Chairman, Administrative Conference of the United States, Before the Committees on Public Works and Interior and Insular Affairs (March 7, 1972).

159. Comptroller General of the United States, Report to the Subcommittee on Fisheries and Wildlife Conservation, Committee on Merchant Marine and Fisheries, House of Representatives, "Improvements Needed in



Federal Efforts to Implement the National Environmental Policy Act of 1969" (May 18, 1972).

160. See, *e.g.*, Department of the Interior, Environmental Impact Statement, Trans-Alaska Pipeline, Alaska (Final, March 20, 1972); International Boundary and Water Commission, Environmental Impact Statement, Emergency Delivery of Colorado River Water to Tijuana, Baja California, Mexico via Facilities in California (Final, June 12, 1972). See also *Wilderness Society* v. *Morton*, 4 ERC 1101, — ELR — (D.C. Cir. 1972) (Canadian citizen and group permitted to intervene to challenge adequacy of consideration in 102 statement of effects on Canadian environment).

161. Department of Defense, Environmental Impact Statement, Operation "Red Hat" (Final, Dec. 31, 1970); Atomic Energy Commission, Environmental Impact Statement, Cannikin-Underground Nuclear Test (Final, June 23, 1971).

162. National Academy of Sciences, *Institutional Arrangements for International Environmental Cooperation*, pp. 30–31 (1972).

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the costs and economic impacts of environmental improvement

Expenditures to improve environmental quality are an investment in the quality of life. As with similar investments in education, the results are not immediately visible as profits or growth in the Gross National Product. Nevertheless, these investments can reap great dividends.

Like any reallocation of resources, the investment to achieve environmental quality will bring about short-run adverse impacts, i.e., higher prices, temporary unemployment, and plant dislocations. Matched against these negative results are the investment's dividends, such as decreased health bills, increased recreational opportunities, diminished damage to materials, and better maintenance of the ecological balance necessary for human survival.

Last year, the Council's Annual Report contained a comprehensive chapter on "The Economy and the Environment." It sketched a preliminary assessment of the costs of environmental improvement. It reviewed the benefits achievable from an improved environment and discussed alternative economic policy strategies for achieving them.

There had been no detailed analyses on the impact of environmental control costs at the time of the Council's initial discussion of the economics of environmental quality last year. Yet on the basis of its preliminary assessment, the Council concluded that benefits of environmental protection would exceed the admittedly substantial costs. The Council also felt that although some older and smaller firms might be forced to shut down, with associated local dislocations, the economic impact of these pollution control costs on overall national economic growth, employment, and prices would not be severe.

In 1971, the Council, together with the Environmental Protection Agency and the Department of Commerce, undertook a series of studies of pollution control costs and their impact on the economy. These economic impact studies support the Council's initial judgments. The studies, based on current air and water pollution standards, found that the impact of those pollution control costs that were estimated and examined would not be severe in that they would not seriously threaten the long-run economic viability of the industrial activities examined. However, the estimated impact is not inconsequential in that there are likely to be measurable impacts both on the economy as a whole and on individual industries.

The studies indicate that some firms will earn lower profits, some will curtail production, and other firms and plants will be forced to close. The studies go on to note, however, that most of the firms or plants that will be forced to close are currently marginal operations that were already in economic jeopardy due to other competitive factors. In these instances, the impact of the environmental standards is to accelerate such closings.

Because of limited data on the ways in which pollution control requirements will affect industrial activity, none of the studies can be considered definitive presentations of total impact on the industrial activities examined or on the economy. However, it is reasonable to believe that the relative relationship of postulated standards and pollution abatement cost consequences is at least indicative of the nature and order of magnitude of the economic impacts.

Although these studies focused on adverse economic impacts, it should be noted that there will be positive economic impacts as well. Examples of positive impacts not addressed by the microeconomic studies are increased profits and employment in industries producing pollution abatement equipment and services and relatively low polluting products; and increases in sales and market shares by firms that are more efficient in the use of environmental resources. Relating these economic benefits to the transitional dislocations is difficult. For example, pollution abatement requirements may cause sales and employment to rise in one industry while they decline in another, but the employees laid off in the declining industry are not likely to be reemployed immediately in the other, because of geographic or skill factors.

This year, the Council also has expanded its estimates of control costs to include some areas where standards are not now authorized or promulgated but are likely in the near future. Because of new information on costs and the recently completed studies on impacts, the Council decided to focus solely on the costs of environmental improvement and the impact of those costs.

Although the chapter does not explicitly deal with benefits of reducing environmental damages, clearly they are critical to our decisions on what level of environmental quality should be attained. Existing evidence indicates that, in the aggregate, the benefits from current environmental programs are measurably greater than the costs. Nevertheless, it is important to develop better data to allow assessment of the benefits to be achieved from additional environmental control expenditures.

Those interested in the available benefit data, as well as the Council's broader review of the economic aspects of environmental improvement, should read "The Economy and the Environment" chapter of last year's Annual Report.

the costs of environmental controls

The Council's 1971 estimates of environmental management costs were limited to air and water pollution control and solid waste management spending. They included control costs, but not the costs of monitoring the environment. Many of the data were selective or based on case studies, engineering estimates, or surveys, and the full impact of emerging standards was not known. Insofar as possible, comparable methodology was used, but the basic assumptions in the cost studies varied widely. Byproduct revenues, estimated equipment life, allocation of process change costs between pollution control and increased productivity, and numerous other factors were not dealt with uniformly. Estimates reflected the assumption that emission and effluent controls would be achieved through treatment. They did not fully consider other methods, such as process changes, improved plant management, and recycling, which might decrease total costs.

Many of these problems still exist. But this chapter presents data and analysis improved in several respects: Costs have been estimated for controls in a number of additional environmental areas—noise from commercial aircraft, sediment from construction, water pollution from feedlots, radiation controls for nuclear powerplants, and reclamation of surface-mined lands. Last year's air and water pollution control data have been updated to reflect new information on standards and control costs. Finally, the time frame examined has been expanded to include the entire decade of the seventies, including both the period when accelerated investments are needed to meet the requirements of new standards (1970–76) and a more normal period after the backlog of investment has been met (1977–80). This extended time frame also picks up the significant operating costs which will be required by investments made during the previous periods.

The updated cost estimates for air and water pollution control come from reports and studies by the Environmental Protection Agency (EPA) and other Federal agencies. In general these costs are based on existing standards which are now law. In the event that the existing best practicable technology requirements for water pollution control beyond 1976 are replaced by requirements for recycling or best available technology, presently under consideration by the Congress, the estimated water pollution control costs could rise significantly, especially after 1976. The raw data for the newly covered pollution control areas were either supplied by relevant Federal agencies or collected from other secondary sources, as indicated in each case.

The new areas of environmental control costs discussed in this chapter highlight an important limitation in calculating a total cost of achieving environmental improvement. We are in a period of changing standards and control technology. It is also a time of increasing concern reflected in legislative action on an ever wider variety of environmental problems. Consequently, any estimate only approximates the total cost of realizing a high quality environment.

categories of costs

The broad types of environmental protection expenditures included in this chapter are outlined below.

air pollution—This category includes control costs for stationary sources, such as factories and power plants, and for mobile sources, specifically automobiles.

The bulk of all air pollution control costs are private expenditures for controlling mobile and stationary source emissions. The cost of controlling heavy duty vehicle emissions is excluded because of the uncertainty over applicable standards. The relatively small public control costs are limited to Federal expenditures to control air pollution from Federal facilities and municipal expenditures to control air emissions from solid waste disposal. All estimates are of the costs of meeting existing standards established under the Clean Air Act.[1] If more stringent State standards are adopted, costs would be higher. Detailed assumptions underlying the data can be found in the 1972 edition of EPA's *The Economics of Clean Air*.[2]

Many States and localities are considering the use of mass transit systems, traffic controls, and similar measures to help meet the ambient air quality standards. The costs of these measures, unlike emission control requirements, are not included.

water pollution—This year's estimates, like those of last year, are based primarily on control expenditures by municipalities, manufacturing establishments, and electric utilities as required by the Federal Water Pollution Control Act.[3] Federal spending includes funds to upgrade Federal facilities and naval vessels. EPA construction grants to municipalities are included under the State and local category along with the funds contributed by those governments. These costs cover treatment plants and the interceptor sewers, pumping stations, and outfalls associated with such plants. Cost for improvements to collecting sewers and combined sewer systems are shown, but not included in the total costs in this chapter because of insufficient data, the uncertainty of the control techniques that will be used to deal with combined sewer overflow, and the unknown degree to which such controls will be needed to meet water quality standards.

Expenditures by municipalities and manufacturing establishments are drawn from the 1972 edition of EPA's *The Economics of Clean Water*.[4] The estimate for utilities is from the microeconomic study on electric utilities discussed later in this chapter.

Three new estimates have been added to the water pollution control section: feedlots, construction sediment, and vessel pollution.

Livestock and poultry production in feedlots, where many animals are kept in close confinement, frequently account for major discharges of wastes into streams during storms. In fact, they are the predominant pollution source in some river basins of the Midwest. New Federal water pollution control legislation, passed by both the House and Senate in different versions, would require controls on feedlot discharges.[5] It has been estimated that it would cost the larger livestock and poultry producers from several hundred million dollars up to almost $3 billion in capital expenditures to achieve the types of controls that these new bills would require.[6] Small livestock and poultry producers generally would not be required to make significant capital expenditures. Based on the data available, a $1.8 billion investment has been used for the following calculations.

Construction activities generally expose the land to erosion. The pending Sediment Control Act, an amendment to the Federal Water Pollution Control Act,[7] would require States to establish sediment control programs for building and construction activities. The new water pollution control legislation recently passed by the House and Senate also would require State sediment control programs. The cost of sediment control for housing construction programs is estimated at between $100 and $150 per structure.[8] It is assumed that there will be 2 million residential units in approximately 1.2 million individual structures started annually between 1972 and 1980.[9] However, because regulations will be based on meeting water quality standards, not all homes will require controls. For purposes of this analysis, it is assumed that one-half of all structures will require a $125 investment each in controls, for a total investment of $900 million.

The Department of Transportation estimates that adequate control of sediment during federally aided highway construction represents up to 0.5 percent of the overall cost of a highway. At projected levels of Federal highway cost sharing with States during the 1970's, $333 million will be expended for sediment control during highway construction.[10] Expenditures for nonfederally aided highways have not been included. Also not included in these estimates are expenditures for continuing sediment control on highways, farms, and the like.

Also included this year are estimates for controlling waste discharges from Federal vessels, U.S.-based commercial vessels, and recreational craft. Capital investment of $930 million will be required between 1971 and 1980 for equipment on vessels and for onshore facilities.[11] EPA's recently issued regulations for vessel waste discharges are discussed in Chapter 1 of this Report.

solid waste—This year's estimate includes the costs of collecting and disposing of residential, commercial, institutional, and industrial solid wastes. Not included in this category are costs to dispose of the residuals generated from air and water pollution controls. These significant costs have in part been included in the air and water pollution control cost estimates, but comprehensive estimates are not available at this time.

The cost data through 1980 are calculated by assuming proportional increases in annual expenditures to keep pace with growing waste generation, with only small expenditures estimated for upgrading disposal facilities. However, given the long time period and the potential for more efficient operation and solid waste recycling, the costs may be overstated, perhaps significantly.

noise—There are no comprehensive estimates of the cost of lowering noise to more environmentally acceptable levels. Such costs will vary depending on the levels established and the classes of noise sources included. Estimates have been made for reducing noise from existing commercial jet aircraft, for which Federal regulatory authority has existed for years, although no retrofit regulations have as yet been promulgated. Because no specific requirements are yet stated, this cost is not included in the total costs shown in this chapter.

A National Aeronautics and Space Administration study estimates that available technology can lower aircraft noise levels during takeoff and landing by approximately 30 to 75 percent for existing aircraft. Modifying the commercial fleet anticipated by 1980 would require an investment of $860 million to $2.7 billion.[12] Because new aircraft are initially designed to be quieter and because it is difficult to separate noise control costs from other engine costs, estimates have not been included for new aircraft. Clearly, there will be some incremental costs due to increased aircraft weight, higher development costs, and other factors.

radiation—Since enactment of the Atomic Energy Act of 1946, radioactive emissions have been regulated by the Federal Government. Last year the Atomic Energy Commission proposed that existing and planned light-water cooled nuclear reactors be modified or designed to reduce emissions so that the exposure of individuals in the surrounding population to radiation will be no greater than 1 percent of the level then recommended by Federal Radiation Council guidelines.[13]

To meet those standards, additional air and water effluent controls must be installed in each plant. The incremental costs of these systems are expected to be $600 million in capital expenditures to modify currently operating reactors as well as those now under construction. Costs to bring the expected number of new reactors to be built by 1980 up to these standards total $800 million, for a total of $1.4 billion.[14] The costs for current levels of controls have not been estimated because high levels of radiation control are an integral part of every plant design, and it is extremely difficult to separate control costs from other plant costs.

land reclamation—Half of all coal and almost all nonfuel mining is accomplished with surface mining techniques. Surface mining, if uncontrolled, is a significant source of water pollution, particularly sediment and acid mine drainage. Mining also causes aesthetic blight, disruption of wildlife habitat, and sometimes destruction of personal property. The pending Mined Area Protection Act would require that States set up regulatory programs to assure adequate reclamation.[15]

Costs of reclamation vary widely—from estimates of a few hundred dollars per acre to over $5,000 per acre.[16] For these calculations, unit costs were assumed to be $2,000 per acre for all disturbed acreage. Although this cost estimate is probably high, it does lend perspective to the relative costs of high levels of land reclamation. It is estimated that acreage disturbed will increase from 220,000 acres in 1970 to 330,000 acres in 1980.[17] Because it is difficult, if not impossible, to apportion the costs between water pollution control and land enhancement, all costs are included in the latter category.

Many categories of environmental controls are not included in this chapter, such as controls on fertilizer runoff from agricultural lands, pesticide restrictions, and oil spill controls on tankers. Thus, the total cost estimates presented here understate the total cost of environmental protection. However, the relatively small expenditures required by the new categories added this year suggest that these additional categories will not greatly increase the aggregate control costs, although they may be large with respect to the activity regulated.

total costs

There are a number of ways to measure environmental control costs. Total costs consist of those that are already being incurred, the added costs of meeting new standards, and the costs of providing control for increasing population and new productive capacity. They represent a measure of national resources which must be used to meet environmental goals and are therefore unavailable for other uses.

Table 1 lists the investment in and annualized costs of pollution control for the categories discussed above for 1970 and 1980 and for the 10-year -period of 1971 to 1980. As indicated, total national annualized costs (i.e., operating costs plus interest and depreciation on investments in environmental controls) will rise from $10.4 billion in 1970 to $33.3 billion in 1980, an increase of 220 percent. On a per capita basis, this represents an increase from about $51 per person in

Table 1

Total Pollution Control Expenditures

[In billions of 1971 dollars]

Pollutant/medium	1970			1980			Cumulative requirements 1971–80		
	Capital investment		Annual-ized cost	Capital investment		Annual-ized cost	Capital invest-ment	Operating costs	Cash flow
	In place	Annual		In place	Annual				
Air Pollution									
Public	0.2	0.1	0.2	0.8	<0.05	1.0	1.1	6.8	7.9
Private:									
Mobile automobiles [1]	.3	.2	.3	19.3	5.1	9.0	31.5	29.5	61.0
Stationary	1.0	.7	.3	9.7	.9	4.7	15.6	22.0	37.6
Total	**1.5**	**1.0**	**.8**	**29.8**	**6.0**	**14.7**	**48.2**	**58.3**	**106.5**
Water Pollution									
Public:									
Federal	NA	NA	.2	NA	<.05	.3	1.2	2.7	3.9
State and local:									
Treatment systems	18.2	1.3	2.3	29.4	1.6	3.7	18.9	23.6	42.5
Collecting sewers	(12.6)	NA	NA	NA	NA	NA	NA	NA	NA
Combined sewers	NA	NA	NA	NA	NA	NA	(17–56)	NA	(17–56)
Private:									
Manufacturing	4.8	1.1	1.0	11.8	1.0	2.4	11.9	14.2	26.1
Utilities	.3	.1	.1	3.8	.3	.8	4.5	4.2	8.7
Feedlots	0	0	0	.7	<.05	.5	1.9	1.8	3.7
Construction sediment [2]	NA	<.05	<.05	NA	.1	.1	.9	.1	1.0
Vessels	0	0	0	.3	<.05	.2	.9	.5	1.4
Total	**23.3**	**2.5**	**3.6**	**46.0**	**3.0**	**8.0**	**40.2**	**47.1**	**87.3**

Noise [3]									
Commercial jet aircraft	0	0	0	NA	NA	NA	(.9–2.7)	NA	(.9–2.7)
Radiation									
Nuclear power plants	0	0	0	1.2	.2	.2	1.4	.7	2.1
Solid Waste [4]									
Municipal:									
Public	NA	.1	2.2	NA	.3	9.7	3.0	83.1	86.1
Private	NA	NA	2.4						
Industrial process waste	NA	NA	1.4						
Total	**NA**	**.1**	**6.0**	**NA**	**.3**	**9.7**	**3.0**	**83.1**	**86.1**
Land Reclamation									
Surface mining [5]	0	0	0	0	0	.7	0	5.1	5.1
Grand total [6]	**24.8**	**3.6**	**10.4**	**77.0**	**9.5**	**33.3**	**92.8**	**194.3**	**287.1**

[1] Excludes heavy duty vehicles.

[2] Only includes sediment control for housing and highway construction.

[3] Aircraft noise control only; investment occurs during 1973, 1974, and 1975.

[4] Annualized costs for municipal and industrial process waste exclude interest and depreciation due to lack of data.

[5] Does not include reclamation of past damage; all costs are considered to be annual expenses.

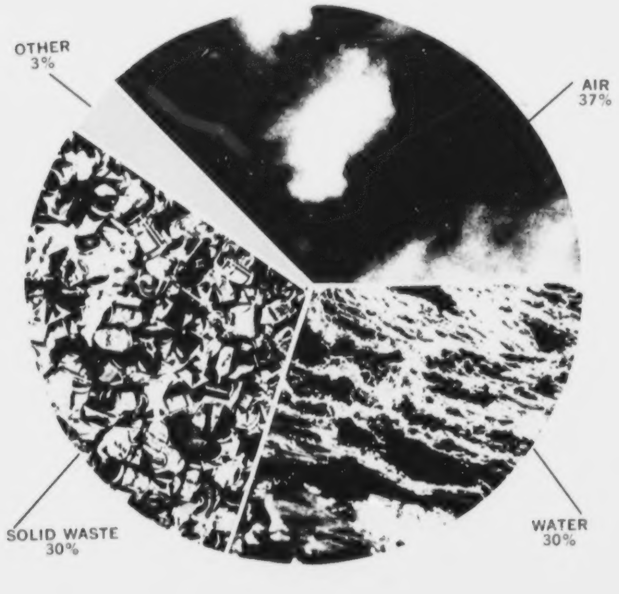
[6] Does not include the non-add items, noise, and combined sewers.

1970 to about $145 per person in 1980.[15] Cumulative cash expenditures from 1971 to 1980 will total $287.1 billion. Figure 1 shows the percentage of total costs for air pollution, water pollution, solid waste, and other controls. If the non-add items—aircraft noise control and combined sewer separation—were included, the investment would rise by between $17.9 billion and $58.7 billion. Operating costs would also increase, but the actual amount is not known.

The total cost estimate of $287.1 billion is nearly three times larger than last year's less comprehensive estimate of $105.2 billion. If the former figure is reduced to remove the new categories added and the longer time period covered, the two estimates are more comparable. The costs over the entire decade for all the new categories added, e.g., feedlots and urban sedimentation, add just $9.6 billion. The remaining increased cost is primarily the result of covering a 10-year rather than a 6-year period, when each additional year adds over $9 billion

Figure 1

Total Cumulative Environmental Expenditures By Category 1971-1980



TOTAL = $287.1 BILLION

Source: Based on data from Environmental Protection Agency and other Federal agencies in cash outflows for automobile air pollution controls alone. Each additional year also adds significantly to the solid waste and water pollution totals.

Even if a comparable time period were used, however, there would still be increases from last year's estimates because higher unit cost estimates were used for automobiles and utilities and because all data were changed from 1970 dollars to 1971 dollars.

As with last year's report, the Council compared its estimates, based on Government sources, with estimates made by the private sector. A survey by McGraw-Hill estimated that investments by American business of $22.8 billion would be required to bring all existing facilities up to present air and water pollution control standards.[10] As reflected in Table 1, the Council estimated air and water pollution control expenditures for the 1972 to 1976 period at $24 billion. These figures are not strictly comparable, however, because the Council's estimate is for new as well as existing facilities. The most interesting aspect of McGraw-Hill's report is the actual and planned expenditures by business for pollution control (Table 2), which shows a 51 percent planned increase in 1972 over 1971 expenditures.

Table 2

Actual and Planned Business Investment in Pollution Control

[In millions of 1971 dollars]

	1971 (Actual)	1972 (Planned)	Percent change
Air	1,801	2,862	59
Water	1,444	2,044	42
Total	**3,245**	**4,906**	**51**

Source: McGraw-Hill Publications Co.

incremental costs

Although total control costs show the total level of resources that must be allocated to environmental quality improvements, they are not a good indicator of economic impacts. Because substantial amounts of money are currently being spent to clean up air and water pollution and to dispose of solid wastes, current prices and production activities already reflect these costs. Further impacts on prices, levels of production, and employment will result only from imposing new costs.

Table 3 details incremental expenditures for new pollution control requirements above those costs required to operate, maintain, and replace facilities in operation in 1970. Consequently, these in-

Table 3

Incremental Pollution Control Expenditures

[In billions of 1971 dollars]

Pollutant/medium	1980			Cumulative requirements 1971–80		
	Capital investment		Annualized cost	Capital investment	Operating costs	Cash flow
	In place	Annual				
Air Pollution						
Public	0.6	<0.05	0.8	0.9	4.8	5.7
Private:						
Mobile automobiles	19.0	5.0	8.7	31.1	26.7	57.8
Stationary	8.7	.8	4.4	14.6	20.0	34.6
Total	**28.3**	**5.8**	**13.9**	**46.6**	**51.5**	**98.1**
Water Pollution						
Public						
Federal	NA	NA	.1	1.2	.7	1.9
State and local:						
Treatment systems	11.2	1.1	1.4	13.6	6.1	19.7
Collecting sewers	NA	NA	NA	NA	NA	NA
Combined sewers	NA	NA	NA	(17–56)	NA	(17–56)
Private:						
Manufacturing	7.0	.8	1.4	9.7	6.6	16.3
Utilities	3.5	.3	.7	4.4	3.7	8.1
Feedlots	.7	<.05	.5	1.9	1.8	3.7
Construction sedimentation	.7	.1	.1	.9	.1	1.0
Vessels	.3	<.05	.2	.9	.5	1.4
Total	**23.4**	**2.3**	**4.4**	**32.6**	**19.5**	**52.1**
Noise						
Commercial jet aircraft	**NA**	**NA**	**NA**	**(.9–2.7)**	**NA**	**(.9–2.7)**
Radiation						
Nuclear power plants	**1.2**	**.2**	**.2**	**1.4**	**.7**	**2.1**
Solid Waste						
Municipal:						
Public						
Private						
Industrial process waste	NA	.2	3.7	2.0	23.1	25.1
Total	**NA**	**.2**	**3.7**	**2.0**	**23.1**	**25.1**
Land Reclamation						
Surface mining	**0**	**0**	.7	**0**	**5.1**	**5.1**
Grand total	**52.9**	**8.5**	**22.9**	**82.6**	**99.9**	**182.5**

cremental costs include only costs above that level either to meet new standards or to provide environmental controls for growing population and increased industrial production. They do not indicate the level of expenditures which in 1970 were already being incurred by public bodies and industry. The total incremental cost of $182.5 billion reflects a 175 percent increase in expenditures over the level needed to maintain 1970 levels of environmental control. This total approximates changes in resource allocation and can be used to assess the effects of new environmental controls on the economy.

High levels of spending prior to 1970 are particularly important to solid waste management, where large sums historically have been spent for collecting and disposing of municipal wastes independent of any regulatory requirements. Substantial expenditures also have been made for decades in municipal and, to a lesser extent, industrial water pollution control. In other areas, primarily air pollution, water pollution from feedlots, noise, and land reclamation from mining, large increases in expenditures will be required in a relatively short time period to meet new regulatory requirements, either enacted or pending.

Figure 2 shows contributions to incremental costs for air and water pollution, solid wastes, and other categories.

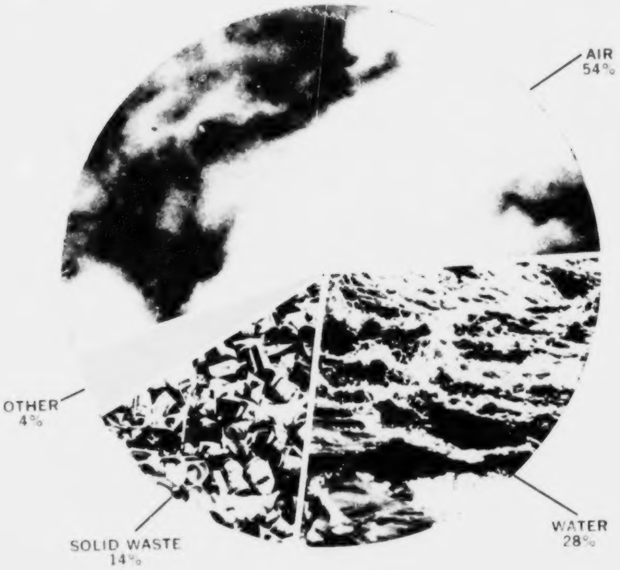
impacts of control costs on the economy

In absolute terms, the pollution abatement costs outlined in the previous section seem large. Yet, in the aggregate, they are relatively small when compared with measures of total economic activity such as the Gross National Product (GNP). During the 1971 to 1980 period, GNP is expected to total over $13.2 thousand billion.[20] Consequently, total environmental costs represent 2.2 percent of total GNP for this period, compared to 1.6 percent for the 1970–1976 period reported last year.

As mentioned before, the Council, EPA, and the Department of Commerce sponsored a series of economic impact studies to assess the impact of pollution control costs on the general economy and on selected key industries most likely to be severely affected. The study on the general economy examined the impact over the whole decade. The individual industry studies evaluated the economic impacts through 1976—roughly the year when current air and water standards must be met and the period during which most dislocations would occur. If standards do not change after 1976, additional control costs would only be incurred to replace, operate, and maintain existing facilities and control new sources. If standards become more comprehensive or stringent, the costs and the impacts as well will change. Estimates have not been made for these additional impacts—which may not be proportional to the cost increases. Further efforts are required to refine the economic impact data, particularly in the area of international trade impacts. New studies are now underway, building on the studies already completed.

Figure 2

Total Incremental Environmental Expenditures By Category 1971-1980



TOTAL = 182.5 BILLION

Source: Based on data from Environmental Protection Agency and other Federal agencies

The remainder of this chapter is a reprint of the Overview Section from the summary of the CEQ-EPA-Commerce studies entitled *The Economic Impact of Pollution Control: A Summary of Recent Studies*, published in March 1972.[21]

The purpose of this overview is to put into perspective studies which were conducted to assess the economic impacts of air and water pollution abatement requirements on a number of industrial activities.

The studies were conducted under contract with the Council on Environmental Quality, the Environmental Protection Agency, and the Department of Commerce. The Council of Economic Advisers provided guidance on economic methodology for the studies.

The contractors' reports included summaries, detailed analyses, and background data. [Summaries of these studies are printed in the March 1972 publication.]

Adequate data are not yet available on all the ways in which pollution control requirements will affect industrial activity. Environmental standards as well as the changes being induced in the way materials are extracted, processed, transported, fabricated, consumed, and ultimately disposed of are not only extensive but still evolving. Comprehensive studies would require a great deal more time to conduct than was allotted to these preliminary analyses.

In view of these recognized limitations, none of the studies can be considered definitive presentations of total impact on the industrial activities examined or on the economy. However, it is reasonable to believe that the relative relationship of postulated standards and pollution abatement cost consequences are at least indicative of the nature and order of magnitude of the economic impacts.

In general, the studies found that the impact of those pollution control costs that were estimated and examined would not be severe in that they would not seriously threaten the long-run economic viability of the industrial activities examined. However, the estimated impact is not inconsequential in that there are likely to be measurable impacts both on the economy as a whole and on individual industries.

background

Pollution abatement regulations have been implemented by government at all levels in order to reduce the substantial and rising costs society has been bearing as a result of pollution. These costs are reflected to varying degrees—sometimes subtly, sometimes directly—in such factors as increased demands for medical services, property devaluations, lost man-hours of productive work, lower crop yields, shorter useful lives of manmade structures, animal losses, and soiling costs, as well as in such considerations as aesthetics and the quality of life.

In the absence of public action, the full costs to society of producing goods are not reflected in the prices of goods since society rather than the producer bears the costs of pollution. Environmental regulations are a means to internalize these costs by requiring producers to bear the costs of pollution abatement. As prices change to reflect pollution abatement costs, consumers can be expected to shift their purchases to relatively less expensive goods which are produced with lower pollution abatement costs. Hence, more low-pollution and fewer high-pollution products will be produced. As a result, less pollution will be created, fewer resources will be required for pollution abatement, and more resources will be available for meeting society's demands for other goods and services.

However, the process of reallocating society's economic resources outlined above can in the short run have adverse as well as positive impacts on society. Specifically, transitional economic dislocations may occur. For example, although sales and employment may be rising in one industry while falling in another, the employees laid off from one industry are not likely to be immediately hired by the other industry due to such considerations as geography, skill requirements, and lack of knowledge of job opportunities.

The purpose of the economic impact studies was to begin to develop a better understanding of the nature and order of magnitude of the adverse impacts of environmental regulations on the economy as a whole and on individual industries and regions within the economy.

Although these studies focused on adverse economic impacts, it should be noted that there will be positive economic impacts as well. An example of positive economic impacts, which were not addressed by the microeconomic studies, is increased profits and employment: (a) In the industries that produce pollution abatement equipment and services, (b) the industries that produce relatively low-polluting products, and (c) some of the firms in the industries that are impacted by environmental regulations (i.e., firms that absorb the market shares previously held by firms that are not efficient when measured by their use of total resources, including the environment, and thus close when they must incur pollution abatement costs).

Examples of positive economic impacts, which were not addressed by either the microeconomic or macroeconomic studies, are: (a) Possible productivity increases where environmental regulations stimulate technological develpoments (e.g., changes in production processes which both increase productivity and reduce pollution), and (b) increases in the average level of productivity in some industries as environmental regulations result in the closing of plants that are inefficient in their use of total resources. Further, no attempt was made to quantify the economic benefits of a cleaner environment (e.g., higher crop yield, increased man-hours of productive work), or to compare these benefits with the cost of pollution abatement. Finally, since the macroeconomic analysis employs the conventional national income accounts framework, it overstates the net costs (or understates the net benefits) to society because such accounting fails to include the benefits of a cleaner environment.

approach

One macroeconomic study and eleven microeconomic studies were conducted. The macroeconomic study used a computer-based econometric model to determine the impact of pollution abatement costs on such macroeconomic variables as growth of GNP, inflation, unemployment, interest rates, and balances of trade and payments.

The microeconomic studies concentrated on major elements of 11 specific industries selected in part because of availability of pollution abatement cost data from the Environmental Protection Agency and in part because they were thought to represent a reasonably complete spectrum of industrial activities that might experience significant dislocations and impacts. The microeconomic studies concentrated on such variables as sales, prices, profits, plant closings, employment, and community impacts in the industries studied.

While effects on related (customer, supplier, and competing) industries were examined, the simultaneous impacts on different industries and their cross relationships were not studied in detail.

All of the studies were performed by contractors; the specific industrial activity areas examined and the contractors are listed in Table 4.

cost definitions and assumptions

In interpreting the findings of these studies, it is important to be aware of the nature and limitations of the cost data and the key assumptions which were used. Although these are outlined in each report in detail, some of the major considerations are outlined below:

The investment costs of pollution control equipment were defined to include the direct incremental investment required to attain environmental standards: (a) For existing facilities and (b) for new facilities. The operating costs for pollution control equipment were defined to be incremental and net of any productivity increases or by-product revenues. It should be noted that the figures used in these studies sometimes differ from the cost estimates prepared by others. However, in general, a significant portion of such differences can be explained by the fact that the costs were estimated using definitions different from those above.

The water cost data were estimated under the assumption that the relevant standard is the best practicable treatment—roughly the

Table 4

Economic Studies

	Consulting firm
Microeconomic studies:	
Automobiles[1]	Chase Econometric Associates, Inc.
Baking	Ernst & Ernst
Cement	The Boston Consulting Group, Inc.
Electric power generators	National Economic Research Associates, Inc.
Fruit and vegetable canning and freezing	AgriDivision, Dunlap & Associates, Inc.
Iron foundries	A. T. Kearney & Co., Inc.
Leather tanning	Urban Systems Research & Engineering, Inc.
Nonferrous metals smelting and refining (aluminum, copper, lead, zinc)	Charles River Associates Inc.
Petroleum refineries	Stephen Sobotka & Co.
Pulp and paper mills	Arthur D. Little, Inc.
Steelmaking	Booz-Allen Public Administration Services, Inc.
Macroeconomic study	Chase Econometric Associates, Inc.

[1] All of the microeconomic studies analyzed the impact of the pollution abatement costs associated with assumed air and water emission standards on an industry, except in the case of the automobile study, in which the impact of the cost of the auto-emissions-control device required to meet legislated auto emissions standards was analyzed.

industrial equivalent of secondary treatment. If the pending water quality bill set more stringent standards to be met at any time in the next decade, investment and engineering decisions would undoubtedly be affected and higher costs would result.

The air cost data were estimated in most cases under the assumption that the same set of emission standards would apply in every State. The standards assumed were those published by EPA in the guidelines for developing State implementation plans. If the States adopt different control strategies in order to meet national ambient air quality standards, the costs would vary accordingly. The studies did not include consideration of the proposed sulfur tax.

Only air and water pollution abatement costs associated with Federal standards were considered. If localities implement more stringent standards or other standards (e.g., standards for odors), the total pollution abatement costs would be higher than assumed in these studies. Further, although some solid waste costs were reflected in the air and water estimates, these were not comprehensively estimated. Because the volumes of solid waste which will require recovery and disposal will vary appreciably depending upon how air, water and solid waste control requirements are addressed, no meaningful and comprehensive solid waste control costs can as yet be estimated.

The year in which the pollution abatement costs must be absorbed is a significant determinant of economic impact. For the purpose of the studies, it was assumed that all pollution abatement costs for existing plants and for those to be completed by 1976 would be incurred by 1976. Further, it was assumed that the water pollution abatement costs would be incurred in equal increments over the period and that those for air would be incurred over the 5 year period 1972–1976 in the following annual proportions: 5, 10, 35, 40, and 10 percent, respectively.

The microeconomic studies covered only the period 1972–76. The macroeconomic study covered the period 1972–80. For the macroeconomic study the cost estimates for the period 1972–76 included the same estimates as used for the microeconomic studies plus additional estimates of pollution abatement costs for other industries impacted by environmental regulations. For the 1977–80 period, the cost estimates included: (a) The operating and maintenance, interest, and replacement costs on the facilities and equipment installed by 1976 in all industries, plus (b) the capital and operating costs associated with the equipment required for control equipment in facilities expected to be built during the period.

Most cost estimates were based on end-of-line control technologies. Since some of these are still in the early stages of development, the actual cost of these technologies may vary considerably, in either direction, from current estimates. To the extent that firms meet abatement requirements by production process changes rather than end-of-line controls, the costs employed in these studies could be overestimated.

It was assumed that the prices of pollution abatement equipment and services remain constant relative to other prices over the decade. In fact, the prices of pollution abatement equipment and services could rise faster than other prices due to significantly increased demand which is likely to peak in mid-decade. If this occurs, the costs employed in these studies would be understated.

All of the cost data were estimated by the Environmental Protection Agency (EPA). Although the data were examined with the assistance of industry experts identified with assistance of the National Industrial Pollution Control Council (NIPCC), the cost estimates provided to the contractors represented the views of the interdepartmental task force and were not necessarily endorsed by the industry experts. The contractors were asked only to assess the economic impact of the cost data given them. They were not asked to assess the accuracy of the cost estimates. Since definitive cost estimates could not be developed, ranges of estimates were given to the contractors so that they could test the sensitivity of the impact to different cost estimates. However, in some cases, additional cost analyses conducted simultaneously with the economic studies indicated that the actual costs could be higher than even the high range of estimates given the contractors. These additional analyses are noted below in summarizing the contractor reports.

microeconomic impacts

The microeconomic studies indicated that none of the industries studied would be severely impacted in that the long-run viability of no industry is seriously threatened solely by the pollution abatement costs estimated. However, profits will decline for some firms in most of these industries because firms will not be able to pass on the full cost of pollution abatement to consumers in the form of higher prices. Costs will not be passed on completely either because substitute or foreign produced products are available so that none of the firms in the industry can pass on their full costs or because the price increases of the smaller firms which have higher unit abatement costs are constrained by those of the larger firms with lower unit abatement costs. Accordingly, some firms will earn lower profits, some will curtail production, and some firms and plants will be forced to close.

However, the studies indicated there will be some price increases as a result of environmental regulations. Depending on the industrial activity in question, prices are likely to rise from 0 percent to 10 percent over the period 1972–76. This is equivalent to average annual increases of from 0 percent to 2 percent with the bulk of the increases likely to come in 1974 and 1975.

Most of the firms or plants that will be forced to close are currently marginal operations (e.g., smaller, older, less efficient producers) that were already in economic jeopardy due to other competitive factors. In such cases, the impact of environmental standards is only to accelerate closings that would have occurred anyway. The pollution abatement costs either eliminate already slender profit margins or reduce them to a level at which they fail to justify the required capital expenditures in pollution abatement equipment (in terms of an adequate return on investment).

There are approximately 12,000 plants currently operating in the industrial activities studied. Of these it is expected that approximately 800 would close in the normal course of business between 1972 and 1976. It would appear from the contractors' evaluations that an additional 200–300 will be forced to close because of pollution abatement requirements. Many of these additional closings would appear to involve plants that were vulnerable for other reasons and, hence, that were likely to have closed anyway a few years later.

These plant closings and production curtailments will have both direct and indirect impacts. The direct impacts include the loss of jobs and reduced value of equity. An indirect impact is that related (customer and supplier) firms will be forced to close or reduce production. For example, farms which have marketed their produce to a cannery that closed might be unable to find new markets for their produce. Another indirect impact is that the communities where such plants are located may suffer local recessions—an impact which will be most severe in one-plant towns.

The studies suggest that direct job loss attributable to environmental regulations in the affected industry activities examined may range from 50,000 to 125,000 jobs over the 1972–76 period.* These figures represent approximately 1 percent to 4 percent of total employment in the industry activities studied. The direct average annual unemployment created in these industries represents 0.05 percent of the 1970 total national work force. However, the studies suggest that these estimates could be substantially higher if the economy is not at full employment.

While the total plant closings in the industries in which plant closings might have a community impact appear to be about 150, the data presented are not in sufficient detail to determine the number of these communities that will be significantly impacted.

It is important to note that the figures reported in the preceeding paragraphs apply to the industrial activities studied; neither the positive nor negative impacts on other industrial activities have been included. However, in a general sense these other impacts are considered in the macroeconomic study.

In the following section, a brief description of the impact of pollution abatement costs on each of the industry activities studied is presented.

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* These figures represent the total number of people disemployed as a result of environmental regulations. They are not net figures because they do not account for the number of people (conceivably the same people that are disemployed) who find employment in the industry over the same period. In many industries the net figures indicates that more people find jobs than lose them.

automobiles—The study of the automobile industry differed from the studies of all other industry activities. In all other cases the studies focused on the impact of air and water pollution control costs required in the production process itself, while the auto study focused solely on the impact on the industry of air pollution control equipment to be installed on vehicles.

The installation of required pollution control equipment on automobiles and small trucks was estimated to add approximately $350 to the cost of manufacturing a vehicle by 1976–77. This is the same estimate as reported in EPA's "Economics of Clean Air." Since approximately $35 of the $350 was already in place by the 1972 model year, only $315 remained to be added. The contractor rounded this figure to $300, but included a range of ±30 percent in estimating the impact of the cost increase on the industry. The range which he used for cost increase after the 1972 model year is therefore $210 to $390. The cumulative cost increase over the uncontrolled car is $35 higher or $245 to $425.

The contractor was also given an estimate of increased operating and maintenance costs of $65 annually or $325 over a 5-year period (approximately 50,000 miles). However, these costs were not employed in the analysis because the contractor was unable "to reject on either statistical or theoretical grounds the hypothesis that for this range of additions to operating costs the response of new car purchases is negligible." The high estimate (i.e., $425) may or may not capture any impact which these costs might have on auto sales.

It is important to note that the purpose of this study was to assess the impact on the automobile industry of the requirements of the Clean Air Act. It does not include cost increases which can be expected from new safety regulations, costs which some studies suggest are of a magnitude equivalent to those for control of pollution. The increased costs from the two sources, control of pollution and new safety features, could have impacts on the industry which are more than proportional to the sum of these costs.

The contractor's study of demand relationships for all automobiles and among the different classes of automobiles indicated that from 84 percent to 98 percent of the cost increases associated with air pollution control equipment will be passed on to consumers in the form of higher automobile prices. Thus the price of subcompact cars was expected to rise approximately $294 by 1976–77 because of required installation of pollution control equipment. The price of luxury cars was expected to rise approximately $343.

This increase in automobile prices was expected to have two effects upon automobile sales. First, some change was expected in the class of car purchased. In comparison with baseline projections, subcompact automobiles were expected to lose 0.25 percent of the market, and standard sized automobiles 1.6 percent, by 1980 because of the cost of pollution control equipment. This market share would be absorbed to some extent by compacts, intermediate, and luxury cars

(0.26 percent to 0.4 percent); and to a greater extent (0.8 percent) by a new class of cars, the sub-subcompacts, which was expected to be a factor in the market by that time.

It was also expected that because of increased automobile prices, the total sales of new automobiles will be decreased. Projections indicate that, in comparison with baseline estimates, the total number of new passenger car registrations in 1976 would be reduced by 420,000 or 3 percent from 13.31 million to 12.89 million; in 1980 a reduction of 180,000 or 1.2 percent from 14.53 million to 14.35 million was expected.

The reduced sales of automobiles through 1980 are expected to lead to some reduction in employment from the baseline projections, especially in the period 1973 through 1977. Although total employment in the automobile industry is not expected to be reduced below current employment at any time, the growth in employment will be slower than the baseline projections and in some years employment will be reduced from the previous year's level.

The maximum reduction in jobs from baseline projections was 1.8 percent or 18,000 jobs in 1976, from 1,025,000 to 1,007,000. Only in 1 year, 1975, is the total number of jobs in the industry reduced below the previous year's level. In that year jobs are expected to decline by 13,000 or 1.3 percent from 979,000 to 966,000. By 1980, it is expected that industry employment will be 0.9 percent or 9,000 jobs below the baseline projection of 1,044,000.

In 11 other industries significantly affected by these changes, total employment in 1976 is expected to be 0.25 percent or 35,000 jobs below the baseline projection of 13,119,000.

By 1980, however, total employment in these industries is expected to be 53,000 or 0.35 percent above the baseline projection 15,273,000.

Because the contractor assumed a substantial increase in imports of sub-subcompact cars, the U.S. balance of payments is expected to be adversely affected by the increased automobile costs associated with pollution control equipment. The annual net exports of goods and services of the United States are expected to be reduced by a maximum of $700 million in 1980.

baking—Total investment required to meet water pollution control standards associated with the baking process from 1972 through 1976 was estimated to be $11.8 million to $21.3 million. Annual costs were estimated to increase from $400,000 in 1972 to $2 million in 1976. Average costs per pound of products were estimated to range from 0.011 cent to 0.02 cent for bread and related products, and from 0.05 cent to 0.09 cent for biscuits and crackers.

Because costs of pollution abatement in the baking process are so low—0.2 percent of sales—no impact was expected in the bakery products industry.

cement—Capital expenditures required from 1972 through 1976 to meet air and water pollution control requirements associated with the manufacturing of cement in kilns and clinker coolers were estimated to total $122 million. Annual costs were estimated to increase from $3 million in 1972 to $43 million in 1976. These costs average out to $0.08 to $0.10 per barrel of cement.

Projections of cash flow and capital needs including pollution abatement expenditures for the cement industry through 1980 indicated that the industry will be able to meet its cash needs. Given the most severe set of assumptions, however, many changes in the industry's financial policies would be required. These would include a reduction in the dividend payout ratio from 59 percent to 49 percent, and an increase in the debt/equity ratio from 0.39:1 to 0.6:1. Both of these were considered manageable. Alternatively, a 4–5 percent real price increase would be employed to provide most of the required funds.

Pollution control costs in the cement industry were expected to accelerate the current trend in the industry toward the closing of small, old plants and the construction of large, modern facilities. This, in turn, would increase the captal pressure upon the industry. The combined effect has been estimated to result in the closing of approximately 25 cement plants in the 1972–76 period. The additional impact upon cement industry employment was expected to be minimal. Only one possible community impact has been identified.

The increase of prices because of pollution controls was expected to accelerate the current increase in cement imports. No estimate of the magnitude of this impact has been made, however.

electric generation—It was estimated that the total investment required to meet air and thermal pollution control requirements associated with the generation of electricity from 1972 to 1976 will be $10.7 billion. Of this, $7.5 billion would be required for air pollution control, and $3.2 billion for thermal pollution control. It has been suggested that the cost of installing pollution control equipment on existing plants might be twice those included in these estimates. If so, the total investment required through 1976 would reach $17.8 billion. Annual costs associated with pollution controls were estimated to rise from $338 million in 1972 to $2.5 billion in 1976. Costs per kilowatt hour in 1976 would range from 0.22 mils to 1.52 mils depending upon the region of the country. These costs did not include additional costs that might be required for the control of nitrogen oxides and radiation.

The impact of pollution control costs will vary from region to region across the United States depending upon the source of energy employed. In the west south central, for example, almost all generators are gas-fueled, and will require almost no air pollution control facilities. Consequently, pollution control costs in this region in 1976 were estimated to total only 2.8 percent of 1970 average revenues. In the Tennessee Valley Authority region, on the other hand, approximately 80 percent of the generating facilities are coal-fired.

These will be faced with the full cost of air and thermal pollution controls. This, combined with a low revenue level, was estimated to lead to pollution control costs in 1976 totaling 10.65 percent of average 1970 revenues. The average of all regions' air and thermal pollution control costs in 1976 was estimated to be 7 percent of 1970 average revenues.

In the philosophy of utility regulation, justified cost increases are passed on to the consumer. Thus, it can be assumed the above costs will ultimately be passed on completely to the electric ratepayers through higher electricity rates. Past experience, however, indicates that the passing on may not be complete and in any event will occur with some delay. Furthermore, given the complexity and variety of rate structures, it was not possible to determine how these price increases might be distributed among the various categories of consumers.

No adequate information was available on the demand responsiveness of the users of electricity to changes in electricity's price. The total demand for electricity was judged to be extremely unresponsive to price.

Six industries were identified for which electric power costs amounted to 5 percent or more of the total value of shipments. These are Atomic Energy Commission plants, primary aluminum, electrometallurgical products, alkalies and chlorine, industrial gases, and hydraulic cement. The anticipated increase in the price of electricity was expected to have little impact even upon these industries.

fruit and vegetable canning and freezing—Water pollution abatement regulations were estimated to require the investment of approximately $120 million by the fruit and vegetable canning and freezing industry through 1976. Annual costs of pollution control equipment were estimated at $4.3 million in 1972 increasing to $21.3 million in 1976.

In the fruit and vegetable canning and freezing industry, the largest third of the plants produce about 80 percent of total industry volume. These plants enjoy a considerable cost advantage over the remaining plants, and are consequently much more profitable. This advantage has created a trend over the past 10–15 years toward fewer and larger processing plants. Census figures indicate that from 1958 to 1967 the total number of fruit and vegetable canning plants declined 25 percent. The number of fruit and vegetable freezing plants more than doubled from 1958 to 1964, but then decreased 6.6 percent through 1967. Both of these trends were expected to continue through 1980 with a 25 percent decrease projected from 1971 through 1980.

It was expected that the larger canning and freezing plants will also enjoy a cost advantage in installing and operating pollution control equipment. For those plants which must install their own facilities, for example, the price increase that would be required to offset abatement costs would be 5.5 percent for large plants, but 9.6 percent for small plants.

Given estimates that half of the plants will be able to find lower cost abatement solutions, and that 58 percent of the projected abatement technology is already installed, actual price increases were not expected to be as high as above. Prices were expected to rise 1.4 percent to 2.3 percent. Such an increase would cover the average costs of the larger producers, but not of the smaller plants.

The increased prices were expected to lead to a 0.5 percent to 1 percent decrease in consumption. Such a decrease would be less than the total annual increase expected in consumption because of population expansion and increases in per capita consumption.

The increased costs of pollution control were expected to further reduce the profits of the already marginally profitable small plants. Many of these plants will be able to tie into municipal systems or to find other low-cost pollution abatement techniques that will enable them to stay in business. Experience in some states indicates that half of the small plants might be unable to find such alternatives. In this case, up to half of the small plants in the industry, or one-third of all plants, were expected to be forced to close. Of the 1,200 plants included in the industry directory, therefore, 400 might be forced to close because of pollution abatement costs. As noted above, 25 percent of the plants, or 300 of the 1,200, would be expected to close by 1980 in any event. Thus, the addition of pollution control costs was expected to lead to the additional closing of 100 plants, or 8.3 percent of the total. In addition, closing of the other plants was expected to occur some years earlier than otherwise.

It was estimated that the closing of 400 plants would result in the loss of jobs by approximately 28,000 employees. The disemployment created by the 100 plants that were estimated to close because of pollution controls would be one-fourth of that number or 7,000. Many of these would be in small towns and rural areas where reemployment would not be readily available. Up to 90 percent of the jobs lost would be part-time positions.

Because many of the plant closings would be in small towns or rural areas, the community impact of these closings could be significant. This would be further complicated if the farmers in the surrounding areas are unable to find alternate markets for their products. This possibility was suggested, but no careful analysis has been made of the experience in such cases or of the technical factors involved. Accordingly, no estimate is available for the magnitude of this impact.

The impact of increased prices in the industry upon the U.S. balance of payments was expected to be small.

iron foundries—Approximately $348 million in capital expenditures was estimated to control the air pollution associated with the making of iron castings through 1976. Annual costs of pollution control equipment were expected to increase from $6.2 million in 1972 to $125 million in 1976. Average costs per ton of castings produced would depend upon plant size, with an expected range of $2 per ton for large producers to $14 per ton for small producers.

The iron foundry industry is composed of a relatively small number (30 percent) of large producers whose costs and investment per ton of castings are less than half of the smaller producers'. From 1947 to 1969, the total number of foundries has declined from 3,200 to 1,670. Most of these closings have involved small foundries which have been unable to raise capital to modernize. This trend is expected to continue through 1980, with the additional closing of some 670 foundries.

Requirements to install pollution control equipment were expected to intensify capital availability problems, and thereby accelerate the rate of plant closings. It was estimated that approximately 10 percent of these 670 closings would be caused wholly or in large part by pollution control requirements. In an additional 50 percent of the closings, pollution control costs were expected to be a significant factor.

Pollution control costs will range from 1.5 percent to 4.0 percent of sales. Price increases of 1.7 percent to 5.0 percent were expected to be necessary to cover these costs and to preserve current rates of return. Such increases were estimated to be possible with a negligible effect upon demand.

Total employment loss in all plants projected to close by 1980 was estimated at 26,600. It was expected that approximately half of these would be reemployed in other iron foundries. The net unemployment was therefore estimated to be 13,300. For the 60 percent of the plant closings in which pollution control was expected to be a factor, disemployment would be approximately 16,000 with a net unemployment of 8,000.

Approximately 2,250 of these 13,300 unemployed workers would possess transferable skills. The remainder would be unskilled, and was therefore expected to experience difficulty in obtaining reemployment.

Because foundries are generally located near industrial markets, it was not expected that many communities will be severely impacted by the projected closings.

Some increase was expected in imports of iron castings because of increased costs in the United States. Because imports currently account for 0.1 percent of the U.S. market, these increases were not expected to be significant.

leather tanning—The total investment required of the leather tanning and finishing industry between 1972 and 1976 for water pollution abatement equipment was estimated at $89 million. Annual pollution control costs were expected to rise from $2.1 million in 1972 to $10.7 million in 1976.

A survey of the costs of pollution control alternatives available to leather tanneries found that, on average, pollution control costs were less than or equal to 1 percent of sales. At most, costs were found to be 2 percent to 3 percent of sales. Such costs were estimated to be well within the capacity of the industry, which frequently experiences increases and decreases in the costs of its raw-material hides of as much as 50 percent to 100 percent in a 1- to 2-year period. Selling prices have correspondingly changed from 10 percent to 25 percent in the same period with no apparent affect on production. Thus, it was assumed that cost increases of 1 percent to 2 percent because of pollution controls could easily be passed on by the industry.

Available financial data and an industry survey were interpreted as indicating that those firms which were not likely to close for other reasons would be able to finance the required capital expenditures. It was estimated that a few small, marginal firms might close more quickly because of pollution control costs, but this impact was judged to be slight.

The aggregate effects on employment or production in the leather industry as a result of pollution control costs were estimated to be minimal. The closing of beam houses by some firms was expected to result in the unemployment of some 600 workers. These job losses were expected to be widely scattered geographically, however, with no important community impacts. Some subsequent increase in employment was expected where the beam house work would be picked up.

aluminum smelting and refining—Total investment expected to control the air and water pollution associated with the smelting and refining of aluminum for the period 1972 through 1976 was estimated at approximately $935 million. Annual costs were estimated to range from $22 million in 1972 to approximately $290 million in 1976. Cost increases per pound of aluminum in 1976 would average $0.020 to $0.032.

Although the required capital expenditures are large, aluminum producers were judged to have the necessary financial resources.

Cost increases are expected to be passed on to consumers of aluminum. Historically, demand for aluminum has been sensitive to price. Thus it was expected that by 1976 prices increases of approximately 5 percent to 8 percent will lead to a level of aluminum consumption 4 percent to 6 percent lower than would otherwise have existed. In the longer run, price increases of approximately 10 percent were expected to lead to a 13 percent reduction in aluminum consumption. This does not mean that the demand for aluminum would be reduced below current levels. Instead, demand would not grow as fast as would otherwise be expected.

It was not expected that pollution control costs will force any existing plants to shut down, although it is possible that some of the other plants may be closed sooner than otherwise. No decline of employment in the aluminum industry was expected because of pollution controls. As with demand for production, employment would not grow as fast as otherwise.

Increased costs were expected to have an adverse effect upon the U.S. balance of payments by leading to a decline in U.S. exports of ingot and mill products and an increase in U.S. imports of mill products.

The latter effect might be especially severe because pollution control costs may lead to new aluminum smelters being located outside of the United States. No total estimate of the balance of payments effect has been made, although it was noted that the eventual decline in exports may total $100 million to $200 million.

Because of the uncertainties associated with the financial capacity of the industry and the economics of individual smelting and refining plants, further study is currently being made of the impact of pollution abatement requirements upon the aluminum industry.

copper smelting and refining—The capital investment required in the copper industry, because of air and water pollution controls from 1972 through 1976, was estimated to total $300 million to $690 million, with a most likely estimate of $341 million. Annual costs were expected to increase from $6 million in 1972 to $95 million in 1976. Per pound of refined copper, these costs average $0.001 in 1972 and $0.025 in 1976, with a possible high estimate of $0.05 in 1976.

It is expected that the industry can finance the required capital expenditures.

The effect of cost increases has been analysed considering a basic projection for the copper industry without pollution control costs; and two alternative assumptions: (a) That foreign competition will not compete in the U.S. market, so that U.S. producers are able to raise prices, and (b) that foreign competition will prevent any price increase in the U.S. market as a result of pollution control costs. It was assumed that the actual impact of pollution control costs will lie somewhere between these two extremes.

If the average pollution control costs are considered: (a) U.S. production of copper in 1980 was expected to be approximately 7 percent less than the base projections of 4,169,000 short tons if foreign competition prevents price increases while prices and consumption would not change; (b) U.S. production would be 3.5 percent lower than base projections; U.S. consumption 4.6 percent lower; and U.S. prices 4 percent higher; if foreign competition is not a factor.

If costs equal the highest estimates: (a) U.S. production would be 14 percent lower than projected, if no price increase is possible; (b) U.S. production would be 7.4 percent lower; U.S. consumption 9 percent lower, and U.S. price 8 percent higher, if low foreign competition permits price increases.

Thus depending upon costs and foreign competition, it was estimated that U.S. supply may be reduced 3.5 percent to 14 percent and

U.S. consumption 0 percent to 9 percent; and U.S. prices may increase 0 percent to 8 percent because of pollution controls.

It was estimated that most existing U.S. smelters will continue to operate under pollution control requirements. Two smelters were identified, however, as being forced to close. No estimate was made of additional smelters which might close.

With the imposition of pollution controls, employment in the copper industry was not expected to decline, but would grow more slowly than the base projections. Without pollution control costs, employment was expected to grow from 54,000 in 1970 to 76,900 in 1980. Pollution control costs were expected to reduce the 1980 employment by 2,800 to 10,900 or 3.6 percent to 14 percent depending upon the cost and foreign competition assumptions discussed above. Where individual smelters close, of course, all workers would become unemployed. The two smelters identified as closing currently employ 1,150 employees. No estimate was made of the associated mining employment. In both instances, a significant community impact was expected.

No estimate was made of the effects of pollution controls in the copper industry upon U.S. balance of payments. In the extreme case, it was mentioned, all new smelting capacity might be located offshore. This would mean that the current capacity of 3,066,000 short tons would not be expanded to the predicted 4,169,000 short tons in 1980, a reduction of 26 percent from the baseline trend. This would have substantial financial and employment consequences within the industry in addition to the balance of payments effects.

As with the aluminum industry, further study is being made of the copper industry to ascertain on a plant by plant basis the costs of pollution controls and the economic viability of the controlled plants.

lead smelting and refining--The total capital expenditure required to control the air and water pollution associated with the smelting and refining of lead was estimated at about $70 million for the 1972–76 period. Annual costs were expected to increase from $1.1 million in 1972 to $20 million in 1976. Costs per pound of lead in 1976 were estimated as $0.012 to $0.017, with a best estimate of $0.014. These studies did not consider the substantial changes in the lead markets that will be cause by other pollution abatement regulations such as those which would lead to reductions in the lead content of gasoline.

The U.S. lead industry currently can be divided into the low-cost producers in Missouri which account for 55 percent to 60 percent of U.S. production; and the high-cost producers located elsewhere. Estimates of production and pollution control costs indicated that the low-cost producers would be able to raise the required capital and to maintain production even if forced to absorb pollution control costs. High-cost producers, on the other hand, may not be able to raise the required capital. If some are forced to close, this will be an acceleration of the current industry trend which could be expected to continue even in the absence of pollution control costs. Any price increases were expected to be small, reflecting the costs of the low-cost producers. One estimate was of an increase of $0.007 per pound or 5 percent. Such an increase was not expected to alter the trend towards the exit of high-cost producters.

Because the demand for lead was not very sensitive to price, no significant reduction in lead consumption was expected to result from pollution control costs. The shift in production toward the less labor intensive, low-cost producers was expected to result in a net loss of employment in the industry even in the absence of pollution control costs. One smelter which was expected to close soon would result in the unemployment of some 200 persons. Fewer employees would be needed in the low-cost smelters which pick up this demand, and none would be needed in the community where the plant closes.

No estimate was made of the impact of pollution control costs in the lead industry upon the U.S. balance of payments. Some increase in imports were expected, of course, if prices are raised, but the expected price increase was judged to be small. No incentive to relocate smelters abroad is anticipated. Further study is being made of the economic impact of pollution abatement regulations on the lead industry.

zinc smelting and refining—During the period 1972–76 it was estimated that $62 million of capital expenditures will be required to control the air and water pollution associated with the smelting and refining of zinc. Annual pollution control costs would increase from $1.5 million in 1972 to $27 million in 1976. These would average $0.0123 to $0.0267 per pound, with an expected cost of $0.0135 per pound.

The U.S. zinc industry can be segmented into high-cost and low-cost producers, with a trend toward the exit of high-cost producers from the industry. Because pollution control costs were expected to fall upon high-cost producers more heavily than upon their low-cost competitors, and because price increases were not expected to equal pollution control costs, some acceleration in the closing of high-cost facilities was expected from pollution abatement regulations.

An analysis of prices and average production costs for low-cost producers indicated that these producers would be able to absorb pollution control costs and raise the necessary capital even if there is no resultant price increase. It is possible, however, that such a situation would inhibit the expansion of some low-cost producers. No similar analysis was conducted for high-cost producers. It was assumed, however that because the profit margins after absorbing pollution control costs were so small for low-cost producers, that the margins of high-cost producers would be reduced below the opportunity cost of capital and possibly to a loss. Given the pressure of imports and substitute materials, it was not expected that price increases could be large enough to alter these conclusions.

Total employment in the zinc industry is expected to decline in the long run, with three or four smelters closing, even in the absence of pollution controls. The trend would be hastened by abatement requirements, but no estimate was made of the time periods involved. Total employment in the smelters expected to close was approximately 3,000. No estimate of related mining employment was made.

The accelerated demise of high-cost producers and the cost increases for low-cost producers would have a number of effects on the U.S. balance of payments. The closing of some U.S. smelters and the inhibition of expansion of others would lead to an increase in zinc metal imports. This would be partially offset by the reduced imports of concentrates formerly used by high-cost producers. Additional imports of zinc metal were estimated to reach $78 million to $124 million per year. No estimate was made of decreased imports of zinc concentrates.

Further study of the zinc industry is being conducted to ascertain the impacts of pollution abatement requirements on individual smelting and refining plants.

petroleum refineries—From 1972 through 1976, it was estimated that the petroleum refining industry would be required to make capital expenditures of $634 million to $1,155 million to meet the air and water pollution abatement requirements that apply to the refining of petroleum. Annual costs of $2 million in 1972 rising to $21 million in 1976 would also be required. In addition, the cost of using low sulfur fuels in refinery operations was estimated to be $108 million annually by 1976. The average pollution abatement costs per barrel in 1976 were estimated to be $0.06, thus increasing the total cost per barrel by approximately 1.4 percent.

Because capital expenditures for pollution control equipment would equal only 5 percent of the $21.4 billion capital expenditures otherwise projected for the industry in the next ten years, it was considered that these expenditures would be manageable. A price increase of $0.08 per barrel was expected to help defray the added costs. In addition to the annual costs mentioned above, this $0.08 figure included an 8 percent return judged to be necessary to attract the capital required to install control equipment in new facilities. This price increase was assumed to be possible because imports are restricted by law and the demand for petroleum is not elastic.

Given this $0.08 per barrel price increase, it was estimated that most small producers will be able to sustain added pollution control costs. A few, perhaps 12, might be forced to close.

If a dozen small refineries do close, approximately 1,000 workers would become unemployed. These small refineries would probably be located near smaller communities, and thus would have a noticeable local impact. Otherwise, industry employment is expected to increase at about the rate projected without pollution control costs.

If desulfurization of the liquid fuels used in refinery operations is required, additional imports of such fuels were estimated to cost

$40 million per year. No other balance of payments effects as a result of pollution abatement requirements on refinery operations were estimated.

This study did not take into account a number of major changes likely to occur in the petroleum industry. These include Federal requirements for making lead-free gasoline available, restriction of lead content in leaded gasoline, higher average sulfur content in crude oil supplies, and higher market demand for desulfurized residual oil. Further, although environmental regulations will impact almost every aspect of the petroleum industry from exploration through production, transportation and refining to marketing, only the pollution abatement costs related to refinery operations have been estimated. Consideration of the full impact of environmental regulations on the petroleum industry could result in substantial increases in capital requirements and operating costs above those estimated for this study. Additional studies of pollution abatement costs and the economic impact of these costs will be undertaken. The findings of these studies will be made available on completion.

pulp and paper mills—Approximately $3.3 billion was estimated to be required in capital expenditures by the paper industry for the period 1972–76 to meet air and water pollution abatement requirements. Annual costs per ton of product estimated to range from $5.50 to $12.50 depending upon product sector.

Because of an anticipated tightening of supply/demand balances, price increases were expected in the paper industry. These increases were likely to reflect the above-mentioned annual costs of pollution controls. Increases of this magnitude would represent a 3.5 percent to 10 percent increase over current prices depending upon product sector.

Given these increases it was anticipated that most mills will be able to manage pollution control expenditures. However, of the 752 pulp and paper mills in the United States, 329 accounting for 15 percent of U.S. production have been identified as marginal. These mills currently have profit margins much below industry averages (−7.7 percent to 4.8 percent versus 6.6 percent) and may experience pollution control costs approximately twice as large as industry averages. Price increases were not expected to cover their increased costs. This will reduce already low profit margins and create some difficulty in raising the capital required for pollution control equipment.

Even in the absence of pollution control requirements, 30–35 of these marginal mills were expected to close in the 1972–76 period. It was estimated that an additional 60–65 mills would be forced to close with the imposition of abatement regulations. These additional closings were expected to result in the loss of 16,000 jobs by 1976. A larger number of jobs will be made available in plants which are expected to expand, but these of course may not be in the same community. Many of the shut downs are likely to be in rural areas where they would have significant community impact.

Assuming that pollution abatement measures will be similar in all paper producing countries, it was not anticipated that pollution abatement costs would significantly affect the international competitiveness of U.S. paper products.

steel making—Capital expenditures required by air and water pollution abatement regulations were estimated to total $2.4 billion to $3.5 billion for the period 1972 through 1976. Annual operating and maintenance costs were estimated to be $45 million to $70 million in 1972, increasing to $760 million to $1,100 million in 1976. Per net ton of steel shipped, these costs would average from $0.47 to $0.73 in 1972 and $6.60 to $9.60 in 1976.

Price increases to cover pollution abatement costs would be necessary to generate the cash required to meet projected expenditures. The estimated 0.7 percent to 1.5 percent annual increases were considered moderate, however, in relation to historical price increases.

It was expected that most facilities would be able to install pollution abatement equipment and continue operation. This conclusion was strengthened by the fact that the demand may exceed the capacity of the industry to supply steel so that the industry would need all of its current capacity.

The possible effect of price increases upon the U.S. balance of payments was assumed to be negligible because of continued voluntary import restrictions, the realignment of currencies, and the moderate size of expected price increases.

Because the estimates of the industry's ability to finance the required capital expenditures and to maintain operations in the less modern facilities are sensitive to several key assumptions (e.g., substantial increases in demand for domestic steel, current industry capacity), additional analysis is being conducted to confirm the validity of these assumptions.

macroeconomic impact

The macroeconomic study indicated that the national economy will not be severely impacted by the imposition of pollution abatement standards. However, the impact is not insignificant.

In general, the dynamics of impact are as follows. Pollution control costs are assumed to affect the economy in the form of higher product prices and new demands for investments in pollution control facilities by industry ($26 billion in 1971 dollars over the 1972–80 period). Prices rise as a result of the cost-push impact of pollution control costs. In the absence of compensatory macroeconomic policies, the effect of rising prices, which tends to slow the growth of demand in the economy, outweighs the stimulating impact of investments in pollution control facilities. Consequently, the rate of growth of GNP in constant dollars is retarded. The increase in unemployment is tied to the slowdown in real product growth. The current account balance of international trade deteriorates primarily as a result of the increase in domestic prices relative to world prices.* Monetary and fiscal policy adjustments can be initiated to completely offset the slowdown in GNP and employment declines but at the expense of more rapid price rises and further decline in the balance of international trade.

The impact of pollution control abatement costs is discussed below in the context of three alternative projections of the national economy: (a) A baseline projection assuming a return to a near full employment economy and no pollution control costs; (b) the addition of pollution control costs to the baseline projection using best estimates of pollution control costs as well as a variant with costs 50 percent higher than the best estimates; and (c) the addition of compensatory monetary-fiscal policies and pollution control costs to the baseline projection.

To put these findings in perspective, the key assumptions and possible sources of bias are discussed, followed by a brief description of the methodology employed in this study.

baseline projection—The baseline used in this study was constructed to push the economy toward full employment. This trend toward full employment shows the unemployment rate falling to 4.4 percent by 1976. Over the 1971–76 interval, the value of GNP in constant dollars grows at an average annual rate of 5.2 percent and consumer prices by 4 percent.** Because this study concentrates on the changes in the economy due to pollution control costs, the specific details of the baseline case are not at issue here.

impact of pollution control costs—Constant dollar GNP grows more rapidly in 1972 than in the baseline case as a result of additional demand generated by pollution control investments. However, reflecting the impact of higher prices for consumer and capital goods, constant dollar GNP falls below the baseline in 1973 and remains below the baseline throughout the decade. As shown in table 1, the annual rate of GNP growth averages 0.3 percentage points lower over the 1972–76 interval (average annual growth rate drops from 5.2 percent to 4.9 percent) and 0.1 percentage points lower over the decade (from 4.8 percent to 4.7 percent). These averages are not fully informative because the assumed time-phasing of pollution control investments concentrated in 1975–76 lowers the growth rate by one-half of a percentage point in those years, whereas the economy recovers somewhat near the end of the decade.

The impact on prices is felt immediately, with the most significant increases occurring in plant and equipment prices as a result of cost increases in steel, nonferrous metals and electricity. Over the 1971–

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*For lack of data, this exercise assumes that price increases resulting from pollution control occur only in the United States. To the extent that similar price rises do take place in the economies of our major trading partners, the trade effects are overstated.

**These guidelines were provided to the contractor before the Phase II economic policy was announced.

Table 5

Average Yearly Baseline Level and Absolute Differences From the Baseline

	Units	Input of best estimate of pollution control costs			Input 150 percent of best estimate of pollution control costs		
		72 to 76	77 to 80	72 to 80	72 to 76	77 to 80	72 to 80
GNP—baseline average	Billion of 1958 dollars	872.2	1062.8	956.9	872.2	1962.8	956.9
With pollution control costs (P.C.)	"	—4.7	—7.6	—6.0	—7.0	—13.1	—9.7
With P.C. and Monetary Fiscal Policy Offsets [1]	"	0.0	0.0	0.0	.4	1.6	.9
Annual growth of constant dollar GNP—baseline average	Percent	5.17	4.35	4.80	5.17	4.35	4.80
With P.C.	"	—.29	.16	—.09	—.46	.37	—.09
With P.C. and offsets	"	0.0	0.0	0.0	.01	—.01	0.0
Unemployment rate—baseline average	Percent	4.82	4.43	4.64	4.82	4.43	4.64
With P.C.	"	.1	.15	.12	.18	.28	.22
With P.C. and offsets	"	.06	0.0	.03	.04	—.02	.01
Net exports of goods and services—baseline average	Billions of current dollars	2.0	.45	1.3	2.0	.45	1.3
With P.C.	"	—1.2	—.15	—.7	—1.7	.4	—.8
With P.C. and offsets	"	—1.5	—2.5	—1.9	—2.3	—4.3	—3.2
Annual rate of inflation (CPI)—baseline average	Percent	4.0	3.73	3.87	4.0	3.73	3.87
With P.C.	"	.23	—.30	0.0	.34	—.78	—.15
With P.C. and offsets	"	.29	.23	.26	.49	.36	.43
Fixed investment less P.C. investment—baseline average	Billions of 1958 dollars	124.8	153.6	137.6	124.8	153.6	137.6
With P.C.	"	—2.3	—2.5	—2.3	—3.5	—2.7	—3.1
With P.C. and offsets	"	—1.9	—2.8	—2.3	—2.9	—4.3	—3.4

[1] The contractor experimented with monetary fiscal policy adjustments to force the economy back to baseline values of GNP and unemployment. In the case in which costs were increased by 50 percent, the policy offsets do not quite achieve resumption of baseline product and employment paths only because the contractor lacked the time to refine the policy effects.

76 interval, fixed investment prices rise at an annual rate of 0.5 percentage points above the baseline, while the consumer price index increases by 0.2 percentage points on an annual basis from a baseline average of 4 percent per year. Here again, the largest price increases occur in mid-decade. Inflationary pressures ease considerably by 1976, and near the end of the decade prices rise at a lower rate than in the baseline case. In large part this is a result of lesser incremental pollution control costs in conjunction with a greater degree of excess capacity in the economy.

The unemployment rate is slightly higher (0.1–0.2 percentage points from a baseline of 4.6 percent over the decade with employment declines nearly offset by new jobs created by pollution control investments.

Fixed investment, excluding those for pollution control purposes, declines slightly over the decade as a result of slower GNP growth, rising prices and a lower level of capacity utilization in the economy. By 1976, investment levels for nonpollution control purposes are 3.2 percent below the baseline level of $112 billion in 1958 dollars and 1.3 percent below by 1980. Total fixed investment lies above the baseline until 1976 when pollution control investments fall sharply. The resultant decline leaves total fixed investment $0.6 billion below the baseline in 1980.

Net exports of goods and services fall below the base case with imports rising due to domestic price increases. The current account balance declines by more than $1 billion per year over the 1972–76 period from a baseline of $2 billion in current dollars. Less confidence should be placed on the reliability of these trade results because the model deals with such impacts very crudely. However, given the assumption that foreign prices will not increase due to environmental regulations overseas, it is clear that net exports would decline.

Although the previous results were based on best estimates of pollution control costs, another variant was run assuming that pollution control costs were 50 percent higher, in part to account for any costs which may have been excluded. In general these new results (shown in Table 1) were simply about 50 percent greater than before for nearly all variables, e.g., GNP growth over the 1972–76 interval slowed by 0.45 percentage points instead of 0.3. Thus, except for the unemployment rate, which increased by more than 50 percent, variations in economic variables were roughly proportional to the percentage variation in pollution control costs.

impact with monetary-fiscal policy adjustments—Assuming that the Federal Government may try to offset some of these impacts, the contractor experimented with monetary-fiscal policy changes in order to bring the economy back to its baseline path with respect to GNP growth and the level of unemployment. Although it is not at all clear that the particular mix of adjustment policies selected by the contractor, relying primarily on government spending, would be the most appropriate one, the results are nevertheless indicative of the magnitude of adjustments required and the impact of expansionary policy changes.

The fiscal stimulus required to return the economy to its baseline growth path is substantial. Federal spending over the 9-year projection period sums to over $70 billion above the baseline case, implying annual increases in expenditures less revenues of from $7–$10 billion during the last half of the decade.

This stimulus does bring the economy back to the baseline growth path, but in the process it aggravates the impacts on prices and the balance of payments. Inflationary pressures increase slightly in 1972–76 but do not ease off after that period as they did when only pollution control costs were added. For the 1972–80 period, the consumer price index rises by about one-quarter of 1 percentage point annually above the baseline.

The sustained price increases further aggravate the current account balance, generating an average annual decline in net exports of about $2 billion per year over the 1972–80 period.

Interest rates were essentially unchanged because the policy adjustments employed in the study were designed to maintain stable interest rates.

In this case, the effect of raising pollution control costs by 50 percent produces somewhat more than proportional impacts on the economic variables. The Federal budget deficit must be increased to attain baseline GNP levels while prices and the balance of payments deficit increase by slightly more than 50 percent.

assumptions and sources of bias—This section looks at issues which may have biased the results in the areas of the basic pollution control cost data, the method of inserting costs into the model and the model itself. Finally, a few comments are made concerning the probable direction of bias in the macro-impact results.

the input data—(1) Coverage—pollution control costs were included for 15 industry groups which were considered the major sources of industrial pollution. It is probable that other sectors are affected but the empirical impact is expected to be negligible. As shown earlier, pollution control costs are predominantly air and water for industry which excludes costs in the areas of solid waste disposal, governmental water pollution abatement activities and public air pollution abatement. The absence of these figures implies the assumption that there are no incremental costs in industrial solid waste disposal and that no adjustments were made to increase revenues of State and local governments above the baseline projections.

(2) Cost data issues—aside from any difficulties in the engineering cost work, there are some conceptual issues although the direction of possible bias is not clear. For example, investment costs in the

water area include a 20 percent upward revision in part to compensate for down time required to install abatement facilities while down time should be reflected as a decline in production, not as an increase in aggregate demand.

(3) Cost phasing—phasing patterns clearly have an important impact on the timing of economic effects, e.g., assumptions used herein produce the most significant effects in 1974–76. However, it is not clear that other phasing assumptions would reduce impacts over the decade as a whole.

(4) Costs of pollution control facilities—a key assumption underlying the cost data is that the prices of abatement facilities relative to other prices remain constant over the decade. In fact, if new demand is significant enough and especially if demands are bunched, prices of facilities might rise at a much greater rate relative to other prices in the economy. If these effects occur, costs would be understated. Obviously, the time phasing assumption might have a critical impact on the basic cost numbers.

(5) Foreign trade assumptions—no allowance was made in the results for any price increases of world prices as a result of pollution control efforts outside the U.S. or the use of higher cost U.S. goods in production processes elsewhere. To the extent that foreign prices do rise, net exports would rise. Further analyses are to be made that consider increases in world prices. There is also a probability that the United States may be exporting pollution control equipment in the future, a factor which could improve the balance of trade but has not been included in this study.

problems of the treatment of cost data in the model—As mentioned above, a critical assumption in this study is that pollution control costs are entirely unproductive. By making this assumption we have bypassed an area of intense controversy where a great deal of research is now taking place.

Abatement costs are assumed to be based on end-of-line control technologies. In fact, a lower cost approach may be adopted relying on managerial improvements or changes in basic production processes. Such changes would affect the results both with respect to the magnitude of costs which in turn affects the magnitude of increases in prices and in cost of capital.

There are many ramifications of this issue. For example, pollution control efforts may spur increases in labor productivity because of a more rapid adoption of new technologies, which often tend to produce fewer pollutants per unit of output. It can also be argued that cost increases may eliminate marginal firms and thereby average labor productivity could increase if aggregate demand is maintained at full employment. The results also ignore possible feedbacks on labor productivity from improved health, etc., as a result of less pollution which could lead to results different from those indicated by the study.

problems with the econometric model—It is not clear at this point what the nature of bias may be from incorrect specification in the model itself. Clearly the model was not designed to handle the special case of pollution control and thus refinements could be made (such as production functions by industry to account for productivity impacts varying with pollution control technologies). Whether such changes would substantially alter the results reported is not known. One part of the model which may be weak is the trade sector, which is quite simple, including only four or five sectors. For example, if imports fall off more than proportionately as GNP declines, then net exports would not fall as much as they do in current results. Another issue is the inability of the model to capture employment losses due to plant shutdowns or cutbacks as profits, in some cases, are squeezed. Because the model relates unemployment only to aggregate variables, it may understate the impact of pollution control costs on unemployment. While we are not sure bias in the model is significant, we do believe that further study and refinement may be warranted in order to realistically capture pollution control impacts.

possible direction of bias—As a result of this complex set of qualifications, in which some have biases in opposite directions and other factors have unknown effects, no statement can be made with confidence about the direction of net bias in the present study.

methodology—Pollution control costs are assumed to affect the economy in several respects: The efficiency of capital in the aggregate production function is reduced, prices of consumer and capital goods increase, the cost of capital per unit output increases and finally pollution control investments generate new output and employment in industries producing abatement facilities. It is worthwhile emphasizing that the quantitative magnitude of the first three negative impacts hinges importantly on our assumption that pollution control costs are entirely "unproductive" in the sense of generating new capacity in industrial establishments.

prices—Annual costs in the form of percentage cost increases were inputed into the industrial sector of an input-output table. These cost increases are initially converted to first-round price increases by industry markup factors which range from 0.8–1. These price increases are then passed on through other industries which use other products as inputs, assuming that all raw material price increases are passed on 100 percent. After taking account of these interindustry effects, these price increases were passed on through another series of markup factors for final demand components, such as cars, shoes, and plant and equipment. This set of price increases is then used to move the economy off the baseline growth path.

aggregate production function—Pollution control investments are included as a factor boosting aggregate demand in the economy, thereby generating output and employment, but were not considered to augment the productive or capacity-augmenting capital stock of the nation. No adjustment was made for reducing the efficiency of labor in the aggregate production functions, although this effect is probably small compared to that for capital stock.

cost of capital—Since pollution control expenditures are assumed not to be capacity-augmenting, some further adjustment was necessary to reflect the negative incentive this would have on industry's consideration of new investments which would augment capacity. This adjustment was necessary because the determination of investment in the macro model did not explicitly consider the impact of more capital required per unit of output. This was done by boosting the "user cost of capital" by the ratio of pollution control costs to baseline investment levels. Conceptually, this is equivalent to raising the cost of capital needed to produce a unit of output. To provide some feeling for the complicated set of factors which affect investment (excluding pollution control) demands in the model, we note that it is negatively affected by the slowdown in GNP growth, the rise in capital goods prices, the rise in the cost of capital and by the decline in the degree of capacity utilization. Offsetting these factors to some degree, investment demand is stimulated by the increase in wholesale prices.

footnotes

1. 42 U.S.C. § 1857.
2. Environmental Protection Agency, *The Economics of Clean Air: Annual Report to the Congress of the United States*, 1972.
3. 33 U.S.C. § 1151.
4. Environmental Protection Agency, *The Economics of Clean Water*, 1972.
5. S. 2770, 92d Cong., 1st Sess. (1971) (House bill, originally H.R. 11896, passed as S. 2770 in 2d Sess. (1972).
6. Based on data supplied by the Office of Water Programs, Environmental Protection Agency and the Agricultural Research Service of the U.S. Department of Agriculture.
7. Council on Environmental Quality, *The President's 1972 Environmental Program*, pp. 15–38, 1972.
8. Office of Water Programs, Environmental Protection Agency, *Control of Erosion and Sediment Deposition From Construction of Highway and Land Development*, 1971; estimates supplied by the Office of Housing Production and Mortgage Credit, Department of Housing and Urban Development.
9. U.S. Department of Commerce, *Statistical Abstract of the United States*, p. 679, 1970.
10. Data supplied by the Federal Highway Administration, Department of Transportation.
11. Based on data supplied by the Office of Planning and Evaluation, Environmental Protection Agency.
12. National Aeronautics and Space Administration, "Aircraft Engine Noise Reduction Conference: Figure Reprints," pp. IX-1—IX-13, May 16–17, 1972.
13. Atomic Energy Commission, Appendix I, 10 C.F.R., Part 50, 1971.
14. Data supplied by The Directorate of Licensing, Atomic Energy Commission.
15. S. 993 and H.R. 4704, 92d Cong., 1st Sess. (1971).
16. Based on data supplied by the National Environmental Reaserch Center, Environmental Protection Agency, Cincinnati, Ohio.
17. Data supplied by the Bureau of Mines, Department of the Interior.
18. U.S. Department of Commerce, *Statistical Abstract of the United States*, p. 5, 1971; Bureau of the Census, U.S. Department of Commerce, *Population Estimates and Projections*, p. 1, November 1971.
19. Economics Department, McGraw-Hill Publications Co., "Fifth Annual McGraw-Hill Survey: Pollution Control Expenditures," May 12, 1972.
20. Council of Economic Advisers, *Economic Report of the President*, p. 195, 1972; Council on Environmental Quality, Department of Commerce, and Environmental Protection Agency, *The Economic Impact of Pollution Control: A Summary of Recent Studies*, p. 323, 1972.
21. The full report is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., for $2.50 per copy. Some portions of the Overview Section have been put in a different order for purposes of this chapter.

9 national parks

A chasm a mile deep and 9 miles wide, its innards a time print of earth's history to the geologist, to the artist a mural of eroded form changing pattern moment by moment from dawn to dusk. A block of the High Sierra country with a 7-mile long valley bounded by towering waterfalls and sheer precipices; close by, a grove of 2,000-year-old Giant Sequoias. A river of grass at the Nation's southeastern tip, tropical paradise habited by alligators and spoonbills, deer and panther. A cliffside village whose residents mysteriously vanished 7 centuries ago, leaving their adobe dwellings, cloth, corn cobs, and shards as reminders to the twentieth century of another far different culture that lived close to the earth. A 2-million-acre tract of geysers and hot springs, canyons and waterfalls, mountain lakes and back-country streams, haunt of the grizzly and black bear, the elk, and the eagle.

These natural and cultural marvels have been called "America's Crown Jewels." To those who have not already guessed, they are descriptions of five of the Nation's leading National Parks—Grand Canyon, Yosemite, Everglades, Mesa Verde, and Yellowstone. "Crown Jewels" may be a particularly fitting term to define the founding principle of the National Parks. Where before nations had sought to preserve the jewels of their monarchs for future generations to view and admire, the idea of a century ago marked the saving of natural crown jewels, not only to be seen by future generations in their original condition but also to be used for recreation of the body and mind.

One traveling throughout the world finds the concept of the National Park to be one of the United States' most recognized attributes—and one of its leading exports. More than 100 nations have followed the U.S. pattern and have designated National Parks or Nature Reserves of their own. The national park idea is considered unique, not for the objects preserved but for the concept that a nation would decide that it is in the common interest of all of its citizens to set aside millions of acres for their natural and cultural worth, excluding industrial, agricultural, or residential development that might impair continuance of the areas in or near their original state.

The National Park System that has grown up over the past century is, however, more than a collection of the Nation's natural crown jewels. It now embraces 247 areas other than National Parks which have been set aside—Historical Sites, Scenic Rivers and Trails, Parkways, Seashores and Lakeshores, Recreation Areas, and a Scientific Reserve. To the purposes of preservation and recreation has been added education. At each of the areas, park ranger naturalists or historians seek to interpret the values of the locale to park visitors from all over the world.

Although the National Park System constitutes only a small percentage of the Nation's geography and satisfies but a fragment of the people's total recreation demand, it has another significance. The National Parks, especially, constitute an early warning system for some of the Nation's values. The parks are beset with problems—overcrowding, pollution, transportation congestion, crime, lack of equal availability to all. Thus the park areas are feeling environmental pressures similar to those that threaten the quality of life in the rest of the Nation. Encroachments on the parks and what the Nation does about them are a test of its resolve to improve the quality of all sectors of our environment. This chapter will deal with National Parks as weathervanes of the Nation's search for a better quality of life and its struggle to turn back threatening inroads before they lead to irreversible damage.

a century of parks

Although the world's first National Park was authorized in 1872 when the Congress set aside 2 million acres in the Yellowstone region of the Rocky Mountains as a public park, the seeds had been sown much earlier. In 1832, explorer-painter George Catlin, while venturing through the wilderness of South Dakota, worried about the possible extinction of buffalo and Indians. Catlin wrote in his journal: "Many are the rudenesses and wilds in nature's works which are destined to fall before the deadly axe and desolating hand of cultivating man."[1] Indians, buffalo, and the wilderness in which they roamed might not have to disappear completely, wrote Catlin, if they were

> (by some great protecting policy of the government) preserved in their pristine beauty and wilderness, in a *magnificent* park, where the world could see for ages to come, the native Indian in his classic attire, galloping his wild horse . . . amid the fleeing herds of elks and buffaloes. What a beautiful and thrilling specimen for America to preserve and hold up to the view of her refined citizens and the world, in future ages! A *nation's park*, containing man and beast, in all the wild and freshness of their nature's beauty.[2]

During most of the nineteenth century, the American frontier spirit of conquering and developing the wilderness far overshadowed concepts of preservation. Occasionally, the Eastern press could be aroused to demand preservation, as in 1852, when two unscrupulous California men cut down a 315-foot-high, 61-foot-circumference Giant Sequoia tree in the Calaveras Grove just north of what is now Yosemite National Park and shipped a 116-foot-high section of bark East for a show in seaboard cities and London. Later, after Horace Greeley and Frederick Law Olmsted discovered the beauty of Yosemite Valley and published articles on the dangers to its survival, the Congress was persuaded in 1864 to grant about 10 square miles of Federal land, including Yosemite Valley plus part of the Mariposa Grove of "Big Trees," to the State of California as a State park. The grant stipulated "that the premises shall be held for public use, resort and recreation [and] shall be held inalienable for all time." [3]

Significant also is the 1865 prophesy about Yosemite by Olmsted, the famed designer of New York's Central Park:

> It is but 16 years since the Yosemite was first seen by a white man, several visitors have since made a journey of several thousand miles at large cost to see it, and notwithstanding the difficulties which now interpose, hundreds resort to it annually. Before many years if proper facilities are offered, these hundreds will become thousands; in a century the whole number of visitors will be counted by the millions. An injury to the scenery so slight that it may be unheeded by any visitor now, will be one of deplorable magnitude when its effect upon each visitor's enjoyment is multiplied by these millions. But again, the slight harm which the few hundred visitors of this year might do, if no care were taken to prevent it, would not be slight if it should be repeated by millions.[4]

yellowstone park established

Although explorers, fur trappers, and prospectors had been wandering through the Yellowstone country since 1807 and bringing back tall tales of smoking earth, high waterfalls, and erupting geysers, it was not until the Washburn-Langford-Doane expedition of 1870 that the full beauty and spectacle of this wilderness became widely publicized and known. While the Washburn expedition was encamped one night, Cornelius Hedges, a Montana lawyer, suggested at a campfire discussion that there should be no private ownership of these wonders but that the area should be set aside forever for public enjoyment. The group agreed and set about making this intention known to others. Another expedition in 1871 led by Government geologist Ferdinand V. Hayden returned with documentation and pictures to verify earlier reports. A bill for the creation of Yellowstone National Park was introduced in the Congress in December 1871. Some Senators opposed the bill. In floor debate, California Senator Cornelius Cole said:

> I have grave doubts about the propriety of passing this bill. The natural curiosities there cannot be interfered with by anything that man can do. The geysers will remain, no matter where the ownership of the land may be, and I do not know why settlers should be excluded from a tract of land 40 miles square in the Rocky Mountains or any other place.[5]

But the bill passed and was signed by President Grant on March 1, 1872.[6]

The Act did not specifically use the words "National Park." But the term was coined in the press, and Nathaniel P. Langford, the first Superintendent, was called "National Park" Langford. The Federal lands in the territories of Montana and Wyoming lying near the headwaters of the Yellowstone River were reserved "and withdrawn from settlement, occupancy, or sale" and "dedicated and set apart as a public park or pleasuring ground for the benefit and enjoyment of the people." [7] The law authorized the Secretary of the Interior to publish rules and regulations providing for the preservation "of all timber, mineral deposits, and natural curiosities or wonders" within the park, to "provide against wanton destruction of the fish and game" [8] and to remove trespassers.

It is doubtful that anyone in 1872 had in mind the start of a vast system of large recreational areas or wildlife sanctuaries. The advocates of Yellowstone Park had originally sought only preservation of the geysers, hot springs and waterfalls, and the few acres around them. They did foresee that as a privately owned area the wonders of these volcanic phenomena might be exploited for the financial benefits of a few. However, because much of the area was unexplored and it was believed that many more geysers and natural "wonders" might exist in the area, the boundaries were extended in the bill passed by the Congress.

What was most significant about the Yellowstone Act, however, was that it set a precedent for Federal ownership of a large block of public domain which could be administered in a manner to bar forever agriculture, mining, grazing, lumbering, and all other exploitation. At that stage of the development of the Nation, there were no competing demands for the resources of the Yellowstone country: No railroads ran within hundreds of miles; the Rocky Mountains were thought inaccessible for timber harvests; the cattlemen had not yet entered the area; waterpower needs had not yet developed; and the presence of hostile Indians made the area unattractive to settlers.

parks' growth slow

The National Park Service did not follow immediately and naturally from the acquisition of Yellowstone. In fact, things went very badly for this newborn concept. The Congress appropriated no funds for Yellowstone in the 5 years after the Park was authorized, assuming that concessioners would pay rents adeqate to provide administration and protection. Hunters took whatever game they wanted. Visitors threw all types of objects into the geysers to see what would happen. For a while, some guides attempted to coax hot springs into geyser action by pouring in soap or concentrated lye. A railroad almost got permission to run tracks through the park and up to the major natural attractions. When proper law enforcement was finally introduced under the Army administration in 1886, rules and regulations were enforced somewhat, but there was little or no progress in resource management. Yet by word of mouth, and especially through newspaper and magazine articles, the fame of Yellowstone spread, and with it the idea of National Parks for all the people took root.

The term "National Park" was not applied by the Congress until 1878 in a general appropriation for civil expenses, which listed an item "to protect and improve the Yellowstone National Park." [9] The first legislation using the term National Park was in 1899 when the Congress authorized and established Mt. Rainier National Park.[10] By the turn of the century, a number of other major areas had been set aside. In 1890, in the Benjamin Harrison administration, Yosemite National Park was established surrounding the valley, and in 1906 the valley lands were re-acquired from the State. Two other National Parks were founded at the same time in California—General Grant (which later was incorporated in Kings Canyon) and Sequoia. As mentioned, Mt. Rainier National Park was established in 1899 in Washington. Crater Lake National Park was set aside in Oregon in 1902, Mesa Verde National Park in Colorado in 1906, Glacier National Park in Montana in 1910, and Rocky Mountain National Park in Colorado in 1915. A number of other large areas were set aside as National Monuments, later to become National Parks—among them Grand Canyon National Monument in Arizona in 1908 and Mount Olympus National Monument in Washington (later named Olympic National Park) in 1909. Establishment of National Parks is shown in Table 1.

In the early days, the National Park concept was unpopular with hunters, miners, loggers, and grazing interests. The Park concept called for elimination of all exploitive use of the areas. This position conflicted with the then-emerging utilitarian school of conservation as pioneered by Gifford Pinchot: using resources for the greatest good of the greatest number of people and not keeping them in their original state. To these early conservationists, dams for power and reclamation and sustained-yield logging were preferable to "locking up" resources forever in National Parks. In 1913, the pendulum momentarily swung to the utilitarian side when Pinchot and his supporters finally won Congressional approval for the Hetch Hetchy Dam within Yosemite National Park to supply water for San Francisco. In

Figure 1

The National Parks—1972

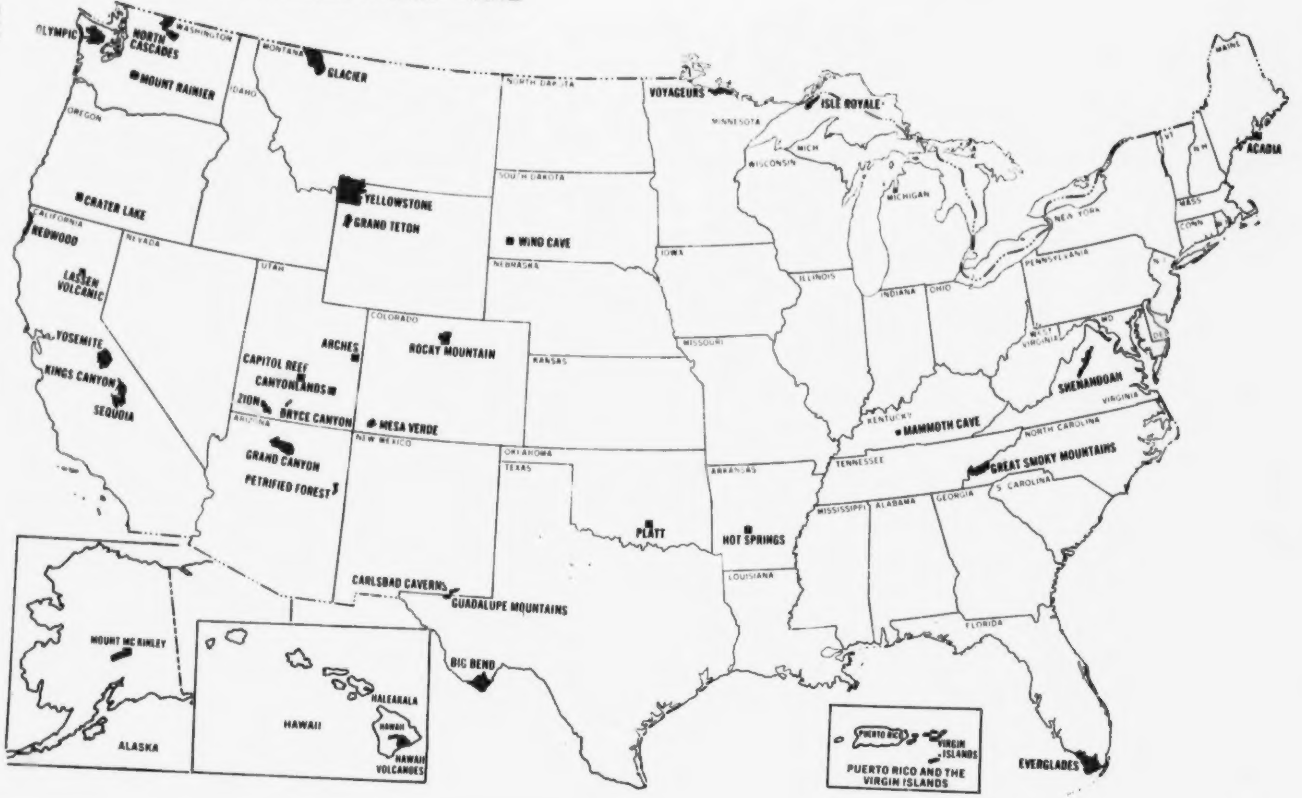
OLYMPIC
NORTH CASCADES
MOUNT RAINIER
GLACIER
VOYAGEURS
ISLE ROYALE
ACADIA
CRATER LAKE
YELLOWSTONE
GRAND TETON
WIND CAVE
REDWOOD
LASSEN VOLCANIC
YOSEMITE
KINGS CANYON
SEQUOIA
ARCHES
CAPITOL REEF
CANYONLANDS
ZION
BRYCE CANYON
ROCKY MOUNTAIN
MESA VERDE
GRAND CANYON
PETRIFIED FOREST
MAMMOTH CAVE
SHENANDOAH
GREAT SMOKY MOUNTAINS
PLATT
HOT SPRINGS
CARLSBAD CAVERNS
GUADALUPE MOUNTAINS
BIG BEND
EVERGLADES
MOUNT MC KINLEY
ALASKA
HALEAKALA
HAWAII
HAWAII VOLCANOES
PUERTO RICO
VIRGIN ISLANDS
PUERTO RICO AND THE VIRGIN ISLANDS
WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
UTAH
ARIZONA
COLORADO
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
MICH
MICHIGAN
ILLINOIS
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
S CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
MD
DEL
PENNSYLVANIA
NEW YORK
CONN
MASS
VT
NH
MAINE

Table 1

National Parks

Park, State	Established	Authorized	Gross area (acres)
Acadia, Maine	1919	[1] 1919	41,642
Arches, Utah	1971	[2] 1971	73,234
Big Bend, Texas	1944	1935	708,118
Bryce Canyon, Utah	1928	[3] 1924	36,010
Canyonlands, Utah	1964	1964	337,258
Capitol Reef, Utah	1971	[4] 1971	241,671
Carlsbad Caverns, New Mexico	1930	[5] 1930	46,754
Crater Lake, Oregon	1902	1902	160,290
Everglades, Florida	1947	1934	1,400,533
Glacier, Montana	1910	1910	1,013,101
Grand Canyon, Arizona	1919	[6] 1919	673,575
Grand Teton, Wyoming	1929	[7] 1929	310,443
Great Smoky Mountains, Tennessee-North Carolina	[8] 1930	1926	516,626
Guadalupe Mountains, Texas	[9]	1966	81,077
Haleakala, Hawaii	1961	[10] 1960	27,283
Hawaii Volcanoes, Hawaii	1916	[11] 1916	229,616
Hot Springs, Arkansas	1921	[12] 1921	3,535
Isle Royale, Michigan	1940	1931	539,341
Kings Canyon, California	1940	[13] 1940	460,331
Lassen Volcanic, California	1916	[14] 1916	106,934
Mammoth Cave, Kentucky	1941	1926	51,354
Mesa Verde, Colorado	1906	1906	52,074
Mount McKinley, Alaska	1917	1917	1,939,493
Mount Rainier, Washington	1899	1899	235,404
North Cascades, Washington	1968	1968	505,000
Olympic, Washington	1938	[15] 1938	896,599
Petrified Forest, Arizona	1962	[16] 1958	94,189
Platt, Oklahoma	1906	[17] 1906	912
Redwood, California	1968	1968	56,201
Rocky Mountain, Colorado	1915	1915	262,191
Sequoia, California	1890	1890	386,863
Shenandoah, Virginia	1935	1926	193,537
Virgin Islands, V.I.	1956	1956	14,419
Voyageurs, Minnesota	[9]	1971	219,431
Wind Cave, South Dakota	1903	1903	28,059
Yellowstone, Wyoming-Montana-Idaho	1872	1872	2,221,773
Yosemite, California	1890	1890	761,320
Zion, Utah	1919	[18] 1919	147,035
Total (38)			15,073,226

[1] Established by proclamation as Sieur de Monts National Monument in 1916; established as Lafayette National Park in 1919; changed to Acadia National Park, 1929. 40 Stat. 1178.

[2] Established by proclamation as Arches National Monument in 1929; redesignated as Arches National Park in 1971. 85 Stat. 422.

[3] Established by proclamation as Bryce Canyon National Monument in 1923; redesignated as Utah National Park in 1924; changed to Bryce Canyon National Park in 1928. 43 Stat. 593.

[4] Established by proclamation as Capitol Reef National Monument in 1937; redesignated as Capitol Reef National Park in 1971. 85 Stat. 739.

[5] Established by proclamation as Carlsbad Caverns National Monument in 1923; established as Carlsbad Caverns National Park in 1930. 46 Stat. 279.

[6] Established by proclamation as Grand Canyon National Monument in 1908; established as Grand Canyon National Park in 1919. (The present Grand Canyon National Monument is another area, established by proclamation in 1932.) 40 Stat. 1175.

[7] Established in 1929; enlarged in 1950 to absorb part of Jackson Hole National Monument, which had been established by proclamation in 1943. 45 Stat. 1314.

[8] For administration and protection. Established for full development in 1934.

[9] To be established after certain conditions of the authorizing acts are met.

[10] Part of Hawaii National Park, established in 1916, until July 1, 1961. In 1960, the Congress authorized establishment of the new park effective July 1, 1961. 74 Stat. 881.

[11] Established as Hawaii National Park in 1916. Name changed in 1961. 39 Stat. 432.

[12] Set aside by Act of Congress as Hot Springs Reservation in 1832. Changed to a National Park in 1921. 31 Stat. 1407.

[13] Establishment Act of 1940 abolished General Grant National Park, which had been established in 1890, and placed its acreage in the new park. 54 Stat. 41.

[14] Act established park to include acreage of Lassen Peak and Cinder Cone national monuments, established by proclamation in 1907. 39 Stat. 442.

[15] Establishment act abolished Mount Olympus National Monument (established by proclamation in 1909 under the Department of Agriculture and transferred to National Park Service in 1933) and placed part of National Monument acreage in new park, the rest in a National Forest. 72 Stat. 69.

[16] Established by proclamation as Petrified Forest National Monument in 1906; authorized for change to National Park in 1958; established as National Park in 1962. 72 Stat. 69.

[17] Sulphur Springs Reservation, established by Act of Congress in 1902, was renamed Platt National Park in 1906. 34 Stat. 837.

[18] Established by proclamation in 1909 as Mukuntuweap National Monument, which area was incorporated in Zion National Monument, established by proclamation in 1918. Established as National Park in 1919. 41 Stat. 356.

this battle, which attracted nationwide press coverage and lasted several years, the losers were the National Park supporters led by John Muir and the Sierra Club. As it has turned out, Hetch Hetchy proved to be the last dam built within the boundaries of a National Park, although strong efforts were later made for dams in Yellowstone and in Dinosaur National Monument and for dams on the Colorado River that would affect Grand Canyon National Park. In defeat, however, Muir had the last word when he wrote that "the conscience of the whole country has been aroused from sleep."

starting the national park service

In 1916, after several years of legislative attempts, the National Park Service was established by the Congress as a bureau of the Department of the Interior, thanks largely to the persistence of Stephen T. Mather, who became the first National Park Service Director. The 16 existing National Parks and 21 National Monuments administered by the new agency had fewer than 400,000 visitors in 1916, and the entire budget for the new directorate, including salaries, travel, and office expenses was $19,500, together with about half a million dollars for operating all the parks and monuments.

Written into the National Park Service Act was a statement of purpose that has stood the test of time—but not without causing problems: "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." [11] In 1916, there was no apparent contradiction in conserving the areas for the enjoyment of the people and leaving them unimpaired for future generations. The struggle in those years was to find ways of getting people to the parks, of building a public base of support, and of getting the Congress to provide money for operations, to acquire new parks, to protect existing parks from commercial development, and to prevent overenthusiastic Congressmen from establishing National Parks out of areas in their States which did not qualify for National Park designation.

Mather, perhaps more than any other individual, deserves the credit for carving out a major role for the Park Service in the Federal recreation and land management hierarchy. A retired Borax mining official, he had written a letter of complaint to a former college friend, Interior Secretary Franklin K. Lane, about the way that National Parks were being operated. When Lane wrote back that Mather should come to Washington and do something about it, Mather did—in 1915. He first became Special Assistant to the Secretary of the Interior before taking over the newly established National Park Service in 1916. Independently wealthy and willing to spend his own money to promote parks, a wilderness advocate and personal friend of industrial and political leaders, he found the secret of attracting attention to parks and park problems by inviting national political and industrial figures and leading writers to join him in back-country camping expeditions into the National Parks. He encouraged railroad presidents to improve service to the parks and found concessioners willing to improve and expand tourist accommodations.

At one point, Mather and Horace Albright (who had been Assistant National Park Service Director from 1916 to 1919 before becoming Superintendent of Yellowstone) threatened to resign when the Bureau of Reclamation succeeded in persuading Secretary Lane to back a series of dams in Yellowstone.[12] Although the bill passed the Senate,[13] Mather and Albright's vigorous opposition helped to defeat the project in the House. Mather was also responsible for professionalizing the field staffs, in particular, the park rangers, placing them under Civil Service.

The coming of age of the automobile and the highway system gave the National Parks the final boost that they needed to become accessible to many citizens. Unrealized at the time, however, were the problems of overcrowding, noise, and fumes that automobiles were later to bring with them.

expanding the national parks

Over the years, while the number of National Parks increased slowly, the Park Service expanded in other ways. Under the Antiquities Act of 1906,[14] major natural attractions, some equally as unique as areas set aside as National Parks, were added to the National Park System under the classification of "National Monuments." These include Arches and Capitol Reef National Monuments in Utah (which were officially made National Parks in 1971); Buck Island Reef National Monument in the Virgin Islands, with its underwater trail; and such outstanding scenic and historic areas as Death Valley (Calif.–Nev.); Canyon de Chelly (Ariz.); Craters of the Moon, (Idaho); Channel Islands (Calif.); Rainbow Bridge (Utah); and Katmai and Glacier Bay in Alaska, both of which are larger than Yellowstone National Park although classified as National Monuments.

In 1933, nearly all Federal parks were placed under administration of the National Park Service, [15] including 15 National Monuments previously administered by the Department of Agriculture and 48 National Monuments, historical parks, battlefields, and cemeteries previously administered by the Department of War. In addition, the public parks, parkways, and buildings of the national capital were transferred to the National Park Service. The Historic Sites Act of 1935 [16] established a national policy of preserving historic sites of national significance under the administration of the National Park Service. The Park, Parkway and Recreation Study Act of 1936 [17] expanded the role of the Park Service into intensive outdoor recreation through national planning based on a nationwide inventory of recreation needs. In the same year, the Congress authorized continuation of the Blue Ridge Parkway, which had been started in 1933. The Congress had authorized the Rock Creek and Potomac Parkway (D.C.) in 1913 and the George Washington Memorial Parkway (Va., Md., D.C.) and Colonial Parkway (Va.) in 1930, but the Blue Ridge Parkway was the first to extend hundreds of miles. In 1937 the system was further expanded to include: seashore recreation when Cape Hatteras (N.C.) was established as the first National Seashore; the first National Recreation Area—Lake Mead (Ariz.-Nev.) in 1936; the first National Scenic Riverway—Ozark (Mo.) in 1964; the first National Lakeshores—Indiana Dunes (Ind.) and Pictured Rocks (Mich.) in 1966; and the first National Scenic Trail—the Appalachian Trail in 1968.

World War II severely set back the growth and progress of the Park Service. The operating budget dropped from $21 million in 1940 to $5 million during the war. After the war, National Park use began to soar. By 1954, the National Park System was absorbing 54 million visits a year with a level of staff and facilities designed for the 17 million visits of 1940. During the "Mission 66" program (from 1956 to 1966), $1 billion was invested to rejuvenate the parks and add Park Service personnel.

Yet even as the parks were being expanded, a more basic problem was surfacing. In the past the stimulus had been to provide the facilities and to encourage people to visit the parks. But by the end of the Sixties, the increase in visits was becoming so extensive in some parks that the quality of the visit itself was declining and the preservation for future generations of a pristine ecology was being threatened by masses of people, by roads, by overnight accommodations, and by service facilities and other developments needed to take care of them.

One of the distinguishing features of the National Parks in this country is the emphasis traditionally given to "interpretation," or educational programs. Since the first interpretative services were introduced at Yosemite in 1920—guided nature walks, campfire lectures, and museum exhibits—interpretation has been regarded as a primary responsibility of the park administration and a key to visitor enjoyment and understanding.

In the last 6 years, the Congress has authorized a number of outstanding large new National Parks—Redwood in California, North Cascades in Washington, Guadalupe Mountains in Texas, and Voyageurs in Minnesota, as well as many Historic and Recreation Areas. None of the new National Parks is as yet adequately staffed and some are not yet ready for visitors. But the recreation demand continues to grow—with visits to all operational National Park Service units increasing from 121 million in 1965 to 201 million in 1971.

national parks' role in recreation

The fact that many citizens consider a visit to a National Park as the highest-quality recreation experience available puts an unusual burden on National Parks to absorb more than a normal amount of the Nation's outdoor recreation demand. The National Park Service, with its 30 million acres (15.3 million of it in the 38 National Parks), has only one-fifteenth of the total Federal recreation land, and less than 5 percent of that is developed for mass use by park visitors. Yet on this limited base the National Park Service absorbs almost 20 percent of the recreation visitation to Federal areas.

While the Government in 1970 reported 837 million visits to Federal recreation areas, many more citizens were seeking recreation at State, county, city, and private recreation sites, which ordinarily were nearer their homes. The National Conference on State Parks, National Recreation and Parks Association, reports that in 1970 (the latest year for which data are available) about 482 million visits were made to State recreation areas. The Bureau of Outdoor Recreation of the Department of the Interior estimates that 1.5 billion visits were made in 1970 to county and city park areas.

Often unnoticed in assessing recreation use is the large number of people who enjoy their outdoor recreation at privately owned areas. A 1965 Bureau of Outdoor Recreation survey [18] estimated 2.6 million private enterprises involved with outdoor recreation, using about 491 million acres of land. These private areas received more than 1.9 billion visits per year. Many such facilities are provided only as a small part of a total business operation and receive very little if any financial investment in maintenance, operation, or development. Thousands of commercial enterprises, however, provide outdoor recreation facilities or services on a full- or part-time basis. Nonprofit clubs and quasi-public organizations help meet the outdoor recreation needs of their members. Industries open millions of acres to the public for some types of public recreation or to provide recreational opportunities for their employees. And about 1 million farms are open to public hunting and fishing. However, many private areas offer insufficient attraction to visitors to compete with public sites.

The Bureau of Outdoor Recreation estimates that as of 1970, public and private outdoor recreation area visits per year totaled about 4.8 billion. As of 1965 (the latest statistics available), land areas approaching 1 billion acres were used either entirely or in part for outdoor recreational purposes. (See Table 2.)

The problem of the National Parks in attracting such a large share of the Federal outdoor recreation use on extremely limited area is intensified by the further gravitation of visitors toward only a small number of major tourist choices such as Yosemite Valley, Yellowstone, and the Grand Canyon—especially in the summer months. It is possible that when the newest National Parks are fully developed and others are added in the future, they may take some of the pressure off the "star" attractions. However, there is a limit of potential park acquisition lands meeting National Park quality standards that could be acquired.

Among potential new National Park areas which are now under study by the National Park Service are several extensive areas in Alaska. Under the terms of the Alaska Native Claims Settlement Act

Table 2

Acreage of and Attendance at Outdoor Recreation Areas, by Level of Government and Private Sector

	Acres, 1965		Attendance, 1970	
	Million	Percent	Million visits	Percent
National Park Service	26.7	3	172.0	4
Other Federal agencies	419.9	43	665.3	14
State agencies	38.7	4	[1] 482.5	10
County and local agencies	5.0	[2]	[3] 1,500.0	31
Private sector	491.0	50	1,960.0	41
Total	982.3	100	4,769.8	100

[1] State park visitors only.
[2] Less than 1 percent.
[3] Estimated.

Source: 1965 Inventory, BOR, and Federal agency reports, 1970.

of 1971, the Secretary of the Interior has set aside for study 80 million acres thought suitable for National Parks, National Forests, National Wildlife Refuges, and National Wild and Scenic Rivers. Another 45 million acres withdrawn under the "public interest" provisions of the Act is also under study. The potential new National Park areas are to be identified by the Secretary in September 1972, and legislation must be submitted to the Congress for the new parks by December 1973. It is expected that new National Parks in Alaska will more than double the land area now set aside in the 38 existing National Parks.

urban emphasis

A new direction of Federal policy in the last 3 years has been to set a high priority on providing recreational opportunities close to major urban centers, with large increases in the Land and Water Conservation Fund. In 1971, President Nixon sent to the Congress legislation to authorize a Gateway National Recreation Area encompassing water, beach, and estuarine areas of 23,000 acres around the entrances to New York Harbor. The legislation has passed the Senate.[19] In February 1972, the President sent the Congress a similar proposal for the West Coast—to establish a Golden Gate National Recreation Area in and around San Francisco, including lands north and south of the Golden Gate Bridge.[20]

Other urban-oriented recreation areas are under study by the National Park Service. It is apparent that in the future much of the thrust of recreation demand will need to be channeled to areas such as the "Gateways," the already established National Seashores at Assateague Island (Md.-Va.), Cape Cod (Mass.), Cape Hatteras (N.C.), Cape Lookout (N.C.), Fire Island (N.Y.), Gulf Islands (Fla.-Miss.), Padre Island (Tex.), and Point Reyes (Calif.), at the several National Lakeshores and National Recreation areas such as Lake Mead (Ariz.-Nev.), Glen Canyon (Ariz.-Utah), and the yet-to-be-developed Delaware Water Gap (Pa.-N.J.)—most of which are reasonably near urban centers of population.

Another way of extending National Park resources to take in more visitors would be to extend roads and increase campgrounds, lodges, and service facilities. But these activities would be at the expense of maintaining intact the unique natural resources.

meeting increased recreation demands

Even with new urban recreation areas and with increased citizen use of National Parkways and National Historical Areas, the "crown jewels"—the unique National Parks—will still be under demands that cannot be met without restricting their use.

With more leisure time, more population, better transportation, and higher incomes, recreation demand on National Parks will automatically increase. Also, as environmental education programs expand to reach residents of less affluent urban areas, interest in National Parks will be stimulated among those who now are not fully aware of the values and opportunities they offer. Middle-income Americans make up the bulk of those who now visit National Parks. As average incomes rise and transportation becomes more readily available, the total source of park visitors will vastly expand.

national forests—Numerous opportunities for outdoor recreation are available from the public lands administered by other Federal agencies. The Nation's system of National Forests, established under President Theodore Roosevelt in 1905, has been the source from which a number of National Parks have been established. The land set aside as National Forests far exceeds that committed to National Parks, covering 181 million acres, in addition to another 6 million acres of National Grasslands. In 1971, outdoor recreation use of National Forests and Grasslands amounted to 180 million visitor days. (A visitor day consists of one person for 12 hours, or equivalent ratio.) About 60 percent of this use was for such activities as sightseeing, hiking, mountain climbing, and hunting, none of which requires special facilities or developments. Opportunities for recreation are available at 84,000 miles of fishing rivers and streams; 15,000 natural lakes covering 1.5 million acres and 3,200 reservoir impoundments covering over 1 million acres; 100,000 miles of trails; and over 200,000 miles of Forest Highways and National Forest development roads. In addition, almost 15 million acres of National Forest land is managed as wilderness, where motorized use and development are not allowed.

The remaining 40 percent of all National Forest and Grassland recreation use requires some kind of special development or facilities. Examples include camping and picnicking, swimming, boating and waterskiing, downhill snow skiing, organized group activities, hotels, lodge and resort activities, and visitor information activities. Opportunities for these activities include almost 7,000 camp and picnic grounds which can accommodate more than 500,000 people at one time, 1,100 boating and swimming sites, 500 observation and viewing areas, and 600 visitor and interpretive sites. These facilities, together with supporting services, are provided and maintained by the Forest Service.

Additional recreation opportunities are provided by concessioners operating under special use permits issued by the Forest Service. The facilities are developed with private investment under close observation and approval of the Forest Service.

Many Forest Service areas are located adjoining or near National Parks and are a potential source for recreation opportunity. Although not so highly publicized as National Parks, a number of the National Forests are scenically unique in themselves. And several Forest Service areas, such as the Boundary Waters Canoe Area in Northern Minnesota, have had heavy recreation demands in recent years which resulted in pollution and overuse of campsites.

corps of engineers—The U.S. Army Corps of Engineers also plays a major role in outdoor recreation. Corps reservoirs provide about 10 million acres of land and water, plus another 1.7 million acres which are leased to local and State governments for fish and wildlife purposes. In 1970, attendance at Corps facilities reached a total of 275 million visitors participating in water-related activities, including 43 million campers.

bureau of land management—A relative newcomer in the recreation field is the Department of the Interior's Bureau of Land Management (BLM). Since 1960, when BLM provided its first camping and picnicking site in western Oregon, the agency has developed 684 recreation sites in 11 western States and Alaska. The Bureau actually has more public land under its management than any other Federal agency, with a total of 453 million acres, which includes 10 million acres of natural lakes and reservoirs, 62,700 miles of fishing streams, and 8,800 miles of trails. During 1971, an estimated 69 million visits were made to BLM areas for recreation uses such as camping, picnicking, fishing, hunting, sightseeing, water sports, and winter sports. In May 1972, Secretary of the Interior Rogers C. B. Morton gave special recreation designation to 2.7 million acres of BLM land in the California desert, withdrawing the land from mineral entry and setting it aside as natural areas, archeological sites, primitive areas, and recreation lands.

wildlife refuge system—The Bureau of Sport Fisheries and Wildlife of the Department of the Interior administers the National Wildlife Refuge System. Comprising some 330 units on 30 million acres of land, this system safeguards a national network of lands and waters sufficient in size, diversity, and location to ensure the protection of wildlife of all types. Although the National Wildlife Refuges are designed to protect wildlife, recreational activities are allowed on many of them when such activities do not conflict with the primary wildlife activities. Most of the recreational use is in the spring and fall when the waterfowl migrations are most spectacular. Public visitation to the National Wildlife Refuge System in 1971 exceeded

22 million. Almost 70 percent of recreation use was wildlife oriented, such as interpretation, fishing, and hunting, while the remaining 30 percent included such nonwildlife activities as boating, swimming, and picknicking. A number of refuge areas have been designated wilderness areas.

tennessee valley authority areas—The Tennessee Valley Authority has made extensive investments in recreation facilities and improvements on TVA lakes and lakeshores. Capital improvements amounting to $310 million include investments in lakeshore home developments, commercial recreation areas, and areas developed by State and local public agencies. Over 47 million visits were made to these areas in 1971. TVA has turned over to States or nonprofit organizations 170,000 acres of land for recreational use. In addition, TVA has developed the 170,000-acre Land Between the Lakes Project between Kentucky Lake and Lake Barkely in West Kentucky and Tennessee, which attracted over 1.5 million visitors in 1971.

outdoor recreation plan—The first Nationwide Outdoor Recreation Plan ordered by the Congress in 1963 [21] is being prepared by the Department of the Interior and is now scheduled to be ready by 1973. The Nationwide Plan is expected to furnish supply and demand data on which to base future decisions. In an effort to gain knowledge of citizen needs for outdoor recreation, the Interior Department in June conducted a series of public forums across the Nation which included participation by non-Federal Government officials and representative citizen organizations and individuals.

revenue sharing—Revenue sharing legislation proposed by President Nixon would, if passed by the Congress, give States and cities funds which they could use to develop and maintain park areas and recreation programs. Expansion of State and local recreation opportunity has already been aided by expanded Federal contributions through the Land and Water Conservation Fund. In the last 2 years, 3,800 matching grants have been made, totaling $300 million. About one-third of these grants have been used to support recreation in metropolitan areas.

expanding private enterprise—Private enterprise must also expand its capacity for recreation. The need is greatest for quality recreation opportunities that can begin to draw away from the overloaded national and State parks those people who would be satisfied at private parks or campgrounds but who now resist going to private sites that are often only crowded trailer parks.

environmental quality in national parks

The U.S. National Park System, while at the height of its popularity and envied by much of the world, is plagued by some severe environmental quality problems. The great expansion of the last 10 years—91 new areas have been added—has, together with a doubling of visits (from 99 million in 1962 to 214 million projected for 1972), strained the ability of the National Park Service to provide the services necessary for a high-quality experience for visitors or to protect the park resources adequately.

effects on the parks

The quality of the park experience is being eroded both by developments within and by influences without. Traditionally, the Park Service has followed an "open door" policy, freely allowing all persons to enter and enjoy the parks. In the past it was possible to accommodate the broad spectrum of park visitors, from wilderness explorers to those preferring to remain in their automobiles. Now, in some parks the sheer number of visitors pouring through the entrance stations at peak periods has begun to interfere with enjoyment of the park experience.

In many parks, developments—roads, hotels, large campgrounds, stores, laundromats, gas stations—which were built to provide necessary services for visitors have become centers of attraction themselves, congested areas which at times resemble suburban shopping centers on Saturday afternoons.

In addition, the buildup of Park Service personnel and concession staffs to take care of the visitors has required large-scale sewage systems and other utilities, hospitals, schools, and maintenance facilities for permanent buildings and utilities. Grand Canyon and Yosemite Valley villages are similar to small cities in the goods and services that they require.

Within the 5 percent of the area of Yellowstone National Park that receives most of the visitor use, the developments include 750 miles of roads, 2,100 permanent buildings, 7 amphitheaters, 24 water systems, 30 sewer systems, 10 electric systems with 93 miles of transmission lines, and a number of garbage dumps. There are 54 picnic areas, 3,143 campsites, and 17,000 signs. Hotel and cabin accommodations are available for 8,586 people each night.

At Mesa Verde National Park, the crowds at the major cliff dwellings became so large that people were barred from going inside because of damage to the structures. Then unrestricted visits to the ruin were stopped and ranger-guided tours provided. Next the size of tour groups was cut down. Finally, a reservation system was set up and a visitor limit per tour set. Further, to lessen congestion on narrow roads, all trailers have been barred from the major ruin area.

At Great Smoky Mountains National Park, automobile traffic jams have brought on the first traffic light within a National Park. At Grand Canyon and Yellowstone National Parks, commercial sightseeing flights taking tourists over key park sites have produced visual distractions and noise. At Rocky Mountain National Park, fragile areas of alpine tundra close to roads have been damaged by excessive use.

Serious crime in National Parks rose 153 percent from 1966 to 1970, compared to a 71 percent increase nationally. Vandalism is frequent. In one recent year, 361 people were caught trying to leave

Petrified Forest National Park with illegally lifted artifacts. Repairing vandalized facilities costs $1 million annually. The defacing of some features, such as Indian cliff carvings, has incurred irreparable damage.

The influx of people to the National Parks is not so environmentally damaging as the cars or trailers in which they arrive. Cars bring congestion, noise, and air pollution. The plethora of camper vehicles, especially on narrow park roads, holds up traffic and leads to a clamor for wider roads. Badly planned and often unsightly satellite development areas—motels, gas stations, bowling alleys, drive-in movies—on the approaches or edges of National Parks add to the problem. Even back-country trails and campsites are showing signs of environmental damage from overuse and pollution.

effects on wildlife

Overcrowding in parks and thoughtlessness of some visitors have affected wildlife. Some people ignore park regulations and feed wild animals. Others, wanting to take a photograph, chase the wildlife.

The variety of wildlife populations and their availability for viewing by park visitors have also suffered. Migration routes have been chopped off by developments outside the park, thus confining migratory animals to an unnaturally small area. The increased activity of humans in developed areas of parks tends to frighten some species away from areas in which they might be seen from roads or trails. The predator populations of a number of parks, especially wolves and mountain lions, were removed in large numbers decades ago for lack of a full knowledge of their role in park ecology. A number of grizzly and black bears which have entered campgrounds or tourist-centered areas in search of food have caused problems. In rare cases in which they threaten visitors, a few animals have had to be killed. Poaching of wildlife is still a problem at some parks and has been especially serious at Wind Cave (S. Dak.), Mount McKinley (Alaska), and Everglades (Fla.), National Parks.

air pollution

Although, by definition, National Parks are examples of unspoiled wilderness, untainted by the progress of civilization, none is in fact "pure." Yellowstone, once the source of pure air sampled by researchers for comparison purposes, now has air that is contaminated by auto exhaust fumes. Each park is being degraded to some degree by the relentless spread of pollution. Death Valley National Monument experiences the smog drifting in from Los Angeles 170 miles away. The forests of Glacier National Park are being damaged by fluoride gas emissions from an aluminum plant 10 miles from the park border. Pesticide residues draining from the agricultural lands of southern Florida have greatly raised the concentrations of chlorinated hydrocarbons in Everglades National Park with adverse effects on the park ecosystem.

water pollution

Another Everglades problem has resulted from man's interference with the regular surface flow of fresh water into the park. It is estimated that 1.5 million wading birds inhabited the park when it was established in 1947. The park wading bird population today is about 50,000 as the result of a series of droughts, diversion of the park's normal flow of fresh water, and agricultural and urban demands. A 1970 Act of Congress,[22] providing that the U.S. Army Corps of Engineers furnish from water impoundments north of the park the minimum fresh water flow annually necessary for the park's existence, has helped these and other wildlife survive the 1970–71 drought and fires.

proposals for change

national park service activities

Man's increasing impact on the beauty, primitiveness, and tranquility of the National Parks has brought the country face to face with the need to protect the ideal born 100 years ago around the campfire at Yellowstone. The goal to make the parks available to all—to enrich and educate an urban society on its natural heritage—conflicts with the goal of preserving the parks in a pristine state. The solution to this dilemma will demand a high level of creative management. To do less may result in unnecessarily roping off the parks to many Americans or to see them further deteriorated from overuse. Better management and interpretive programs can, in some parks allow some increased use with no harm to the environment. In a number of parks, however, the limit has already been reached, and some form of restricted use must be imposed. In those cases, visiting a National Park, like going to a public concert, must be accepted as a privilege and not a right which must be made available to all citizens at times of their own choosing.

The Park Service has undertaken a number of projects to improve the quality of park environments in those park areas where congestion threatens to erode both the resources and visitor enjoyment. In many parks, visitor use can be expanded without damaging the environment by using buses or other forms of mass public transit. The road system at the east end of Yosemite Valley has been closed and a free shuttle bus system introduced. This has drastically transformed a crowded, noisy, smoggy section of the park into a quiet area with most visitors now walking along trails and many riding bicylces. At the Shark River Overlook Loop Road in Everglades National Park, a tram service has been initiated to keep private automobiles off the narrow one-way road. Each vehicle movement disturbs birds in this area of dense wildlife, but birds can adjust if the vehicles are few enough. At Mount McKinley National Park in Alaska large crowds were anticipated this summer when the first highway from Anchorage to Fairbanks was due to open. The major dead-end road inside the park has always been one of the greatest wildlife viewing areas in the

National Park system, alive with grizzly bear, Dall sheep, caribou, and many other animals, all clearly visible from the road. To prevent the wildlife from being disturbed and fleeing the road area, the Park Service is eliminating private automobile traffic along much of the road and instituting a public bus system.

Yosemite National Park now has an experimental campground separated from automobile or trailer parking where only small tents or sleeping bags are permitted, and a minimum fee of 25 cents a night is charged. Overflow camping—use of land unauthorized for campsites—now is prohibited throughout the National Park System.

Essential to the future well-being of the National Parks is public understanding and support. The Park Service policy of holding public hearings on all park master plans should be helpful in generating public involvement. What may seem to be a vast and indestructible wilderness is actually an extremely vulnerable and delicately balanced system.

Some interpretive programs in the parks have already been given a new orientation. Rather than dealing separately with wildlife or geysers or Indian cultures, the programs deal with the total ecology of the region. The Service's environmental education program is readying teaching guides for elementary and high school curricula. And the Service has already established Environmental Study Areas on park lands, including historical parks, for school systems to use.

The Park Service, through its informational activities, is attempting to divert visitors from heavily used areas during peak seasons. Visitors are diverted if possible to the lesser-known areas of the National Park System to avoid crowding into parks that they have already seen. In a nearby National Recreation Area, for example, they may find more water recreational pursuits than in a National Park. The Park Service also points out to visitors that off-season travel is usually less expensive, less crowded, and generally just as enjoyable as summer park trips. Late spring and early fall are ideal in most northern and central latitude parks.

The new master plans for Yellowstone and Grand Teton National Parks would set up visitor centers near the park boundaries. At the centers, visitors could find lodging and service facilities, interpretation of area attractions, help in planning their trips, and advice on other Federal recreation areas in the vicinity if space were not available inside the parks. Also planned are parking and mass transportation facilities at these gateway centers so that people can leave their cars and take buses or mass transit vehicles to the recreation area.

Studies are now underway to determine how the "carrying capacity" of each park might be defined. This will involve working out levels of use that can be tolerated, both by the visitor and by the resource. Establishing these levels of tolerance will require a mix of professional skills working to identify levels of use that will not impair the experience of visitors or damage the park. On an experimental basis, wilderness use is being restricted during the 1972 summer season at

Rocky Mountain, Sequoia, Kings Canyon, and Great Smoky Mountains National Parks. In these areas where extensive use of the back country has begun to diminish wilderness values, the number of people allowed on the trails is being cut back. The outcome of these experiments will guide similar policy in other wilderness parks. Back-country area campers are now required to haul out their own trash and garbage.

Another policy objective of the National Park Service is to preserve for future generations as many examples as possible of varied types of ecological communities that existed in and made up primitive America. A small research program seeks to describe the ecological conditions that should prevail within the parks and to search out those management methods needed to maintain or recreate those ecological conditions. In 1962, an Advisory Board on Wildlife Management, composed of leading scientists and conservationists, reported to the Secretary of the Interior that: "A national park should represent a vignette of primitive America."

The Board, headed by Dr. A. Starker Leopold, recommended that research be undertaken so that maintenance of ecological conditions might be accomplished effectively.

citizen suggestions

As part of the 1972 celebration of the centennial of Yellowstone's founding, the National Park Service commissioned a study of present and future problems and issues facing the National Parks System. More than 30 leading conservation professionals and laymen spent 3 months visiting the parks. Their preliminary report—*National Parks for the Future*—was published in March 1972. In April, a group of 200 conservation professionals, citizen leaders, and youths met for 3 days with Park Service officials at Yosemite to discuss and comment on task force studies and to make additional recommendations. The Conservation Foundation, which carried out the studies for the Park Service, is scheduled to make its final report in August 1972.

The citizen advisers suggested that preservation rather than recreation be the central focus of the National Park Service in the next hundred years. They suggested that hotel accommodations, private automobiles, and car camping be restricted or eliminated wherever possible.

They urged the Park Service, in developing master plans for each park, to consider the areas outside the park boundaries where often unsightly development can significantly blight the quality of the environment for a park-bound visitor. The citizen group recommended that the National Park Service devise an environmental early warning system to spot emergencies and respond to them. The Director of the Park Service was urged to make an annual environmental report similar to the Annual Report of the Council on Environmental Quality in which there would be included for each park an annual "park environment report." These reports would identify, analyze, and comment on changes and trends in the park and in the influence zone outside its borders.

national parks worldwide—a force for peace and understanding

The action of the United States in 1872 in setting up a National Park at Yellowstone and in starting the National Park Service in 1916 has spread throughout the world. Canada, in enlarging the Banff Reservation in 1887 and setting aside that unique scenic area as a National Park, used wording almost identical to the Yellowstone Act. Canada authorized a National Parks Agency in 1911 and now has 28 national parks totaling 32 million acres.

By the turn of the century, Australia, New Zealand, and Mexico, as well as Canada, had established national parks. The Tongariro National Park in New Zealand was established in 1894. The Netherlands patterned the Udjun Kulon Reserve in Indonesia after the American example. The first national park in Africa, the Albert National Park in the Congo, was established in 1925 and was the first park devoted to systematic scientific research. Japan started an extensive system of national parks in the 1930's. Some of the finest national parks in the world now exist in East Africa, with Uganda, Tanzania, and Kenya all having extensive systems. In 1967, the United Nations List of National Parks and Equivalent Reserves showed 1,024 national parks in 95 nations. Today more than 100 countries have national parks or equivalent reserves.

u.s. assistance

Many countries have asked help from the United States in planning their national parks or setting up reserves. The U.S. National Park Service has sent advisers to more than 25 countries, and more than 50 countries have sent experts to the United States to seek information and guidance and to discover, by studying U.S. parks how to work out their park problems. An international course in administration of national parks and conservation areas is held each year, sponsored by the U.S. and Canadian Park Services and the University of Michigan. At each course, approximately 35 park workers and administrators from all parts of the world study at first hand in U.S. and Canadian national, State, and provincial parks. A World Conference on National Parks, held in Seattle in 1962, was attended by 145 delegates from 63 nations, and a Second World Conference, to be held in September 1972 at Yellowstone and Grand Teton National Parks, is expected to draw 500 delegates from more than 90 countries.

international cooperation

International cooperation for preservation of national parks and unique natural areas is also taking place on many fronts. A number of countries that share common borders have national parks facing each other, although cooperation in sharing these park areas has been extremely limited. The United States and Canada, which have had a Waterton-Glacier International Peace Park on the border between Canada's Waterton Lakes National Park and the United States' Glacier National Park since 1932, have only very limited arrangements for making the two parks available for joint use.

world heritage trust

President Nixon, in his 1971 Environmental Message to the Congress, proposed that certain natural, historical, and archeological areas having unique worldwide value should be treated as part of the heritage of all mankind and should receive special recognition as a part of a World Heritage Trust. Such an arrangement would impose no limitations on the sovereignty of those nations which choose to participate but would extend special international recognition to the areas which qualify and would make available technical and other assistance to help in their protection and management.

In accord with this directive, the United States has been working with other nations to create a World Heritage Trust. A convention for this purpose has been drawn up and will be submitted to a U.N. Educational, Scientific and Cultural Organization (UNESCO) conference in October for adoption. At the U.N. Conference on the Human Environment held in June at Stockholm the delegates in plenary session acknowledged that the draft convention "marks a significant step towards the protection, on an international scale, of the environment." They voted overwhelmingly to invite governments to examine the draft convention "with a view to its adoption at the next General Conference of UNESCO."

stockholm conference

Two actions were also taken at the Stockholm conference to improve national parks. The conference recommended that the United Nations Secretary-General take steps to ensure an appropriate mechanism for nation-to-nation exchanges of information on national park legislation and planning and management techniques. It also recommended that governments and the Secretary-General pay special attention to training requirements for national parks. It urged support for integrating aspects of national parks planning and management into courses on forestry and other subjects. It recommended helping schools offer courses in national parks management at a medium-grade level, particularly in Latin America and Asia.

worldwide activities

Battles are still being fought worldwide on the national park scene. In Colombia the rapidly emerging park system has been threatened by petroleum exploration and by proposals to build excessive numbers of hotels too near fragile beach and reef environments. The Argentine Government has begun construction of a power dam and reservoir inside Los Alerces National Park. In Tanzania a part of the Serengeti National Park has been made available for grazing and settlement.

Yet local public support for national parks appears on the rise worldwide. Costa Rica, for instance, has embarked on a comprehensive campaign involving the Government, U.N. agencies, U.S. Peace Corps, the press, the academic community, youth, and the general public that is leading to rapid establishment of high quality, functioning national parks.

IUOTO, the International Union of Official Travel Organizations (soon to become the World Travel Organization of the United Nations), has cited natural areas as the number one destination sought by tourists and master planning as the number one need today in this field. Several countries are embarking upon master plan projects. Venezuela is preparing a master plan for Canaima National Park, the site of Angel Falls, the world's highest waterfall. Guatemala has master planned Tikal National Park, site of the largest Maya Ruins. The government of the Seychelles Island, in the Indian Ocean, has produced a "white paper" on national park policy and plans. Nearly everywhere, especially in Asia and the Pacific, there is mounting concern because of the impact of poor planning, pollution, and overdevelopment on tourism.

conclusion

Ironically, in our love of the National Park ideal lie also the seeds of its deterioration. In a nation whose citizenry is becoming more environmentally aware, the possibility of overuse and damage to the Nation's "crown jewels"—the National Parks—would be an ill-fated irony indeed.

The American contribution to the world of the National Park idea, now universally accepted and widespread, was a major advance in the preservation of the best part of our surroundings. In the United States, with full support, the Congress has expanded the National Park System and broadened its mission.

But the very popularity of the parks has caused the overcrowding and the gradual, subtle loss of environmental quality. To some the original idea of preserving wondrous natural areas in their pristine state has been compromised now in a desire to fulfill a mass recreation role. Yet restricting use of parks runs against the goal of making these crown jewels available to a broad spectrum of Americans, to enrich them, and to help them understand our natural heritage.

Even in the overcrowding there is a larger environmental lesson. Overuse of National Parks, like other environmental problems, results from the wide range of pressures—technology, increasing population, and an ever increasing standard of living. And like these other environmental problems, creative solutions are needed that balance reasonable use of these great assets with protection of their inherent qualities. For the National Parks have become, though nobody intended it that way, a test of our ability to protect natural areas against the pressures of modern society.

The danger is that we may not heed the very warnings first sounded in the parks. If not heeded, there might follow another chapter in "The Tragedy of the Commons."[22] As postulated in a late 19th century treatise, the multiplied individual use of a common pasture by village residents would eventually destroy the pasture for all. The 21st century chapter in "The Tragedy of the Commons" would be the consequence of overusing the fragile areas, thus impairing forever the qualities for which they were originally preserved.

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the environment, 1972—a perspective

The Council's First Annual Report in 1970 predicted that the Nation's quickening concern with environmental quality was no passing fad. Our Second Annual Report in 1971 concluded that "the pursuit of environmental quality has become a firm national commitment" and "an integral part of our institutions and values." At the time of the Council's Third Annual Report, it is clear how deeply engrained the environmental ethic has become in American society. New institutions, new standards, and actions at all levels of government have committed the Nation to a cleanup program that will cost billions of dollars. Large-scale events such as the first Earth Day are being translated into courses and new environmental careers at campuses across the country. The specter of "environmental backlash" is the inevitable result of the success of programs that require changes in attitudes, actions, and investments. The drive toward a higher-quality environment clearly has staying power.

This chapter draws upon the preceding chapters of the report to look at environmental quality from a number of important perspectives. First, it discusses the environment as a physical system and the need to measure accurately and comprehensively the amount of pollutants in the air and water, the uses of our land, the dissemination through the food chain of toxic and persistent chemicals, as well as a wide range of other impacts on the quality of the environment. Second, it probes both the impact of our economic system on the quality of life and the impact of the demands of environmental quality on our economy. Third, it assesses the impact of institutions set up at Federal, State, local, and international levels to deal with environmental problems. Fourth, it underscores the immense and often dimly forseen impacts of technological advances on the whole range of environmental conditions. And finally, it discusses public perceptions of different kinds of environmental problems as an indicator of the concern for solving various types of environmental problems. Each of these perspectives is essential to understanding the progress, conditions, and factors underlying the quality of the environment.

physical factors

First and foremost, the environment is a physical system. Despite our extensive scientific accomplishments, we are only beginning to understand how microscopic fungi or the great cycles that govern the universe affect man and his survival. And we know little of the impacts of pollution on man especially over long periods of time. We must measure the environment as we do the economy and develop simple but meaningful indices of its quality. Only then will policymakers and the general public be able to understand fully the condition of the environment, the success of public and private actions already taken, and what remains to be done.

This year's report presents indices for air quality. Although admittedly crude, they are a starting place from which to develop more sophisticated indices. Next year the Council will refine these indicators and develop indices for other important aspects of environmental quality.

Available measurements show that the quality of air in our cities improved between 1969 and 1970. This tells us that with sustained efforts such as some urban areas have already made and the strong Federal law now covering the entire Nation, real progress can be made in combating air pollution. The data on water pollution, however, are less encouraging. Among other things, they indicate that land runoff from farms and even urban land, as opposed to discharges from cities and factories, has a much greater impact on water pollution than we realized. In all types of river basins, the concentration of nutrients, which can eutrophy our lakes, is increasing. These data indicate that while we carry on our major efforts to clean up pollution from municipal and industrial sources, we must increasingly turn our attention to land runoff—of nutrients, fertilizers, pesticides, organic materials, and the soil particles that often transport the others. If we fail to do so our expenditures for water quality will not achieve maximum improvement.

Data on other parts of our ecosystem are even more fragmented and rudimentary. For example, we need to know much more about how wildlife relates to the health of the entire environment. The Smithsonian Institution has recommended a series of environmental quality indices based in part on the level of selected wildlife populations. But this is only a starting point for the difficult analysis that lies ahead. We also need more meaningful information on land and its use, on the flow of toxic substances and pesticides through the environment, and on other aspects of the environment.

Our knowledge of the environment is still primitive, and our data gathering systems and analytical efforts remain unsophisticated. While indices of environmental quality are being developed, reliable and timely monitoring systems must also be perfected. And more finely focused research must be undertaken to better delineate the relative importance of various factors in the overall quality of the environment.

economics

The Council's Second Annual Report indicated that environmental problems in large measure are rooted in the way that the economy has traditionally operated—such as its failure to reflect the costs of environmental damages. In turn, efforts to maintain and enhance the quality of our surroundings affect the economy.

We have estimated that the capital and operating costs of meeting current environmental standards over the 1970–80 decade will be $287.1 billion. This cost in the aggregate is immense. However, studies of 14 major industries, conducted for the Council, the Environmental Protection Agency (EPA), and the Department of Commerce show that during the 1971–76 period when the bulk of these expenditures will be made, there will be no substantial impairment of the viability of any of these industries. Some plants and firms will reap lower profits, curtail production, or be forced to close. But most of the firms or plants that will be shut down are marginal operations. They are already in economic jeopardy because of other factors such as obsolete facilities or poor location. At most, meeting current environmental standards would accelerate their closing.

When total production costs are included in the prices of final products, the market allocates resources efficiently. If, however, some costs are not included—for example, the costs to society of environmental degradation—then the prices of products are too low. Consumption of products that are underpriced is higher than it would be if all costs were included. As a result, too many resources are devoted to their production rather than to other uses.

The common property resources—air and water—are not included in the market exchange. They are used as free "dumps" for consumption and production residuals. But such dumping exacts social costs—in degraded air and water, impaired health, loss of fish and wildlife, loss of recreational opportunities and aesthetic values, and added costs of treatment necessary for downstream water users. Environmental problems stem largely from this fundamental failure of the economic system to take into account environmental costs.

The traditional measure of the market value of goods and services produced by the economy—Gross National Product—was not designed to reflect overall economic welfare. Environmental values are not now incorporated in this accounting system. Many production and consumption activities degrade the environment, polluting air, water, or land. This degradation is a cost, but it is not subtracted from the value of national output. The measure of output, then, overstates the real value of additional production by the amount of the environmental costs that are ignored. Conversely, when production enhances the environment, the value of total output is understated.

We are seeing more clearly the many social costs of failure to check environmental degradation. The failure of our economic system to take these costs adequately into account in the past has spawned some of the major environmental problems we face today—such as the waste of resources that could be recycled.

International economics is also a vital element in environmental problems. International trade issues still hamstring the world's developed nations in coping with environmental decay and cause problems between the developed and developing nations. The impact of pollution control requirements on trade is one with which the nations of the world must deal consistently or face significant and unjustifiable trade distortions. The member nations of the OECD have reached a number of agreements on cooperation and consultation to keep environmental standards from becoming trade barriers. For example, member nations have agreed on the "polluter pays" principle that industry rather than governments should bear the costs of pollution control. They have also agreed to joint consultation on major regulatory activities that could effect trade.

Some of the developing countries have been wary of adopting environmental controls or agreeing to international controls which they fear will slow down their economic development. They are concerned that increased spending by the developed countries to improve their own environments may cut into the funds available for foreign assistance programs. Finally, these countries are apprehensive that certain environmental actions or potential trends such as increased recycling, lead-free gasoline, and stack gas sulfur recovery processes could dampen the demand for the raw materials that many of them possess in abundance and sell to the developed countries.

Although uniform international standards for environmental protection often are not justified, neither is any nation's disregard of needed environmental controls. Such a policy is shortsighted economically as well as environmentally. There is no evidence in the United States of any relationship between domestic environmental expenditures and the level of foreign assistance. Although environmental actions by the developed countries could cut into resource use somewhat, they are unlikely to cause any significant absolute decrease in overall demand for resources from developing nations. To the extent that this should occur, however, it will be a reflection of more efficient resource use—a type of economic dislocation not dissimilar to those that constantly take place in domestic and world markets.

Economics plays a key part in our effort to achieve a high-quality environment. Intelligent economic decisions and the wise allocation of resources are prerequisites for achieving environmental goals. The costs of effectively controlling pollution are well within the capacity of the American economy to absorb, although there will be some transitional problems. Our Nation's quest for environmental quality can be attained without sacrificing a healthy, dynamic economy. Failure to act would cost the Nation dearly in health impairment, loss of recreational resources, and a decline in the quality of life.

institutions

One very tangible measure of progress toward a high-quality environment is how we structure our institutions to deal with environmental problems. Institutional changes are an important sign of an issue's growth in importance and public recognition.

When an issue of public concern is perceived in its entirety rather than by its components, this perception ultimately is reflected in governmental organization. In the past, as problems have been perceived to be distinct issues rather than subparts of other problems, new departments and agencies have been created to deal with them. This process has occurred for environmental quality activities. Air pollution control programs historically have been the stepchild of health agencies and water pollution control programs the wards either of the same health agencies or of water resource agencies. Solid waste management was considered a sanitation problem to be dealt with by garbage trucks and dumps. Pesticides were considered only an agricultural concern while environmental radiation was dealt with in the overall context of atomic energy. Increasing noise, the spread of toxic substances through the environment, and poor land use practices were generally ignored because no agency was responsible.

As the public and responsible officials began to perceive the totality of the environment and the inter-relationships of pollutants in all media—air, water, and land—they also saw the need for organizational change. The Federal and many State governments have established new comprehensive environmental agencies. The Federal Government and some States have also recognized the need for a broad institutional framework and procedure—such as that established by the National Environmental Policy Act (NEPA)—to guarantee that the environment is respected in all governmental activities.

At the Federal level, the creation of the Council on Environmental Quality, EPA, and the National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce have spearheaded the institutional drive to carry out Federal responsibilities. The value of equipping the President with an Executive Office staff—the Council on Environmental Quality—to advise him, to coordinate the multitude of environmentally related activities of the executive branch, and to shape policies seems clear. The wisdom of centralizing Federal antipollution enforcement in an Environmental Protection Agency has been borne out in EPA's wide-ranging activities over the past year. And the creation of NOAA permits a new focus on understanding and protecting our vital atmospheric and marine resources. The President's proposal for a Department of Natural Resources would complete the institutional structure.

The National Environmental Policy Act has institutionalized a basic reform in Federal decisionmaking. Its 102 process is a valuable new mechanism to guarantee that Federal decisions will be made systematically with environmental values fully in mind. The concrete results of this reform are already surfacing in Federal projects modified or reconsidered and in Federal programs improved. NEPA's mandate for coordination among agencies is helping the Government to handle complex problems which are beyond any one agency's responsibility.

During the past year, the Federal Government has taken a multitude of important regulatory actions, and another major environmental legislative program has been transmitted to the Congress by the President. Many of the requirements of the Clean Air Amendments of 1970 have been initiated. State plans for meeting federally established ambient air quality standards have been acted upon by EPA and approved in large measure as blueprints for achieving clean air goals. Enforcement of current Federal laws and regulations covering water quality and pesticides has continued at a vigorous pace, and the first enforcement actions under the Clean Air Amendments of 1970 are underway. These actions, built upon the newly established institutional base, are forging tangible progress in the Nation's struggle to bring pollution under control. But most of the President's legislative proposals have not been enacted and in some of the affected areas—especially water pollution control—there are significant gaps in authority.

The States continue to experiment with a wide variety of innovative approaches to environmental problems. This experimentation is a critical resource for all levels of government to learn from and to emulate. During the past year, States passed new laws to control land use in and around critical ecological areas, assessed pollution fees to pay for surveillance, and stepped up enforcement to stop pollution. Many States have created entirely new organizations and procedures to analyze their environmental activities and programs.

The understandable attention given to Federal and State activities can overshadow both the very significant accomplishments of local governments and the importance of the role that they play. They bear a major share of the costs for environmental improvement in the public sector—in sewage treatment and solid waste management. Localities still carry a major burden of enforcement responsibility in important areas, notably in air pollution and noise regulation.

the multitude of environmentally related activities of the executive branch, and to shape policies seems clear. The wisdom of centralizing Federal antipollution enforcement in an Environmental Protection Agency has been borne out in EPA's wide-ranging activities over the past year. And the creation of NOAA permits a new focus on understanding and protecting our vital atmospheric and marine resources. The President's proposal for a Department of Natural Resources would complete the institutional structure.

The National Environmental Policy Act has institutionalized a basic reform in Federal decisionmaking. Its 102 process is a valuable new mechanism to guarantee that Federal decisions will be made systematically with environmental values fully in mind. The concrete results of this reform are already surfacing in Federal projects modified or reconsidered and in Federal programs improved. NEPA's mandate for coordination among agencies is helping the Government to handle complex problems which are beyond any one agency's responsibility.

During the past year, the Federal Government has taken a multitude of important regulatory actions, and another major environmental legislative program has been transmitted to the Congress by the President. Many of the requirements of the Clean Air Amendments of 1970 have been initiated. State plans for meeting federally established ambient air quality standards have been acted upon by EPA and approved in large measure as blueprints for achieving clean air goals. Enforcement of current Federal laws and regulations covering water quality and pesticides has continued at a vigorous pace, and the first enforcement actions under the Clean Air Amendments of 1970 are underway. These actions, built upon the newly established institutional base, are forging tangible progress in the Nation's struggle to bring pollution under control. But most of the President's legislative proposals have not been enacted and in some of the affected areas—especially water pollution control—there are significant gaps in authority.

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A number of efforts are underway now to deal with global environmental problems. The Stockholm Conference on the Human Environment produced new agreements in a number of substantive areas and created a permanent U.N. Environmental Secretariat and a $100 million fund for environmental projects.

In the past year the need for bilateral and multilateral cooperation was translated into four specific agreements, three of them involving the United States. President Nixon and President Podgorny of the Soviet Union signed an agreement for bilateral cooperation on a broad range of environmental problems of importance to both countries. The President signed, with Prime Minister Trudeau of Canada, an agreement to restore and protect the Great Lakes. President Nixon and President Echeverria of Mexico issued a joint communiqué on salt pollution of the Colorado River in which the United States agreed to several measures to reduce salinity and to further investigate the extent of the problem. Twelve European nations signed a convention to regulate ocean dumping—an issue on which the United States is actively seeking a worldwide agreement.

technology

The contemporary world is to a great extent determined by technology. Major technological changes can set in motion great population shifts, determine development patterns, and create or solve serious pollution problems. Population in the United States and throughout the world is shifting from rural to urban areas because modern farming technology allows fewer people to produce more food. The automobile has set the pattern of development for all of our major cities. It has also created significant air pollution problems, while at the same time having prevented sanitation problems created by the use of horses. Our massive and complex energy systems have greatly increased our standard of living and given us a wide array of conveniences, but at the cost of degradation of air, water, and land.

No technological changes have had more impact on the environment than changes in transportation. The advent of the automobile greatly increased personal and economic mobility. The factories and merchandising firms which had crowded within the cities were able to obtain efficient transportation to move goods and supplies almost anywhere. New industries were no longer limited to locating along a river or railroad line. People were able to work in the city yet live far away from it.

The scale and speed of technological change may well have outstripped the ability of our institutions to control and shape the human environment. The "spread city" shaped by the automobile is dotted with numerous fragmented governments, each jealous of its own prerogatives. But no governmental institutions exist with the ability to reconcile conflict or to shape the destiny of the region. If some order is to be brought out of the current chaos, State governments must assume a much larger role in land use and major development decisions that have regional impact.

It is important to understand the emerging technologies of the future and their implications for the environment and our way of life. While the automobile gives us great mobility, electronic communications allow us to become increasingly sedentary. Computers are able to manipulate data in ways that the human minds cannot. The development of new agricultural seed strains, fertilizers, and pesticides allows us to expand agricultural production greatly; and development of a wide range of minor technologies even allows us to use electric power to brush our teeth and shine our shoes.

The pace of technological innovation is accelerating. We can foresee major new developments in communications, transportation, energy production, biology, and medicine. We are already beginning to try to comprehend the full impact of such new scientific innovations as genetic manipulation.

Predicting what and how new technologies will shape the future is a difficult task. There are numerous examples of the failure to foresee new developments. In 1937, to take just one example, the National Research Council undertook an extensive investigation of future technological trends. But its report failed to foresee atomic energy, radar, antibiotics, or jet propulsion, all of which were under high-priority development or in practical use 5 years after the report was issued.

Even more difficult than predicting future technological developments is assessing what the full impact of any particular technology will be. We did not anticipate the extraordinary effect that the automobile would have on our living and working patterns, our economy, and our health. We did not foresee that the persistence of some pesticides would become a major environmental problem. Even the simplest of innovations can have far-reaching ramifications. The introduction of the fly screen in many less-developed nations has reduced disease and increased the population, thereby straining the economy and fueling political instability.

Despite the difficulties of assessing technology, it is essential that it be done. Our power to build and destroy has become almost limitless, and the complexity of our technology and institutions has generated decisions with consequences often not apparent for many years. For example, it may take many generations to rid the environment of chemicals which are discovered now to be a threat to man or the environment. The rapid development of new chemicals has strained our ability even to determine their effects. The exponential growth of population and economic development calls for new technologies at a faster and faster rate to keep up with society's demands. This makes technology assessment even more difficult, but it also makes it even more essential, because the future of mankind will be dictated largely by the nature of our technology.

We must develop the institutional mechanisms capable of making technology assessments. The environmental impact statement process under the National Environmental Policy Act and the advanced testing requirements in the proposed Toxic Substances Control Act are two examples of such institutional mechanisms. A variety of other mechanisms exist, but their effectiveness in examining secondary and tertiary effects must be improved, and the knowledge this brings must be better used.

public perceptions

The public's perception of the extent and impact of environmental degradation is an important indicator of the prospect for new or continued efforts to improve these conditions.

To the general public, pollution is still the central environmental issue. Air pollution is the most visible form of pollution. It is centered particularly in and around urban areas, where most of the Nation's people live. Public information campaigns have alerted people to the fact that air pollution is a serious health threat besides being aesthetically objectionable.

Although the average citizen probably comes into contact less often with polluted water, water pollution also evokes strong public concern. In its First Annual Report, the Council suggested some reasons for this concern:

> First, the growth of industries and cities has multiplied pollution in most waterways; second, demand for outdoor recreation has grown in a society increasingly affluent and leisure oriented; and third—a thread running through all the others—is man's inexplicable affinity to water. Whether it is the pleasure he derives from a fountain, the mood of a walk along the lake shore, the relaxation of fishing, or his identification with majestic water bodies—the Danube, the Great Lakes, or San Francisco Bay—man has found tranquility and inspiration in his appreciation of water.

The public's strong interest in solid waste recycling seems heavily based on an opportunity for constructive and creative public involvement and concern over depletion of resources. Although the danger of resource scarcity is disputed by economists and others, it is nevertheless probably the chief stimulus to citizen action. Recycling centers have sprung up throughout the country, manned by women's groups, students, and others.

The public is troubled by the potentially harmful impacts of pesticides and toxic substances. This attitude has been stimulated by the Food and Drug Administration's 1969 seizure and prohibition of the sale of DDT-contaminated coho salmon, the mercury and PCB "episodes" of the past 2 years, and other recent incidents underlining the threats to health posed by a wide variety of substances now flowing through the environment. However, the public is also growing wary of the large number of such threats. We must be certain that our research effort is adequate to support our regulatory authorities so that unnecessary fears are not created.

Public perception of noise—one of our most pervasive pollutants—is growing fast. Although aircraft noise has been the subject of dispute for years, construction noise, vehicle noise, and other forms of noise have long been accepted by most people as a necessary concomitant or urban living. As more people realize that noise control is possible and as people's expectations continue to focus more on the quality of life, the public constituency for noise abatement should likewise grow.

The traditional concerns over wildlife and wilderness areas have been strengthened by the heightened public aspiration for a quality environment generally. Wilderness backpacking, viewing wildlife, and many other outdoor experiences are increasingly popular. And they all are guiding the concern over traditional conservational interests.

Active public interest in wildlife protection is centered largely in a number of national and regional groups dedicated to preserving wildlife. But specific instances of cruelty or other threats to wild animals can evoke broad support for protective measures—illustrated in the recent furor over the mass killings of eagles in Wyoming and other Western States and the support for the recently enacted law to protect wild horses.

In each of the areas discussed above, there is a strong perception of the nature of the problem—even if not always entirely correct—and action is underway at all levels of government. But many of the more fundamental and underlying forms of environmental degradation are not as widely perceived, broad public support has not emerged, and hence progress is limited.

Land use is one of these areas. There is no clear consensus on what comprises good land use. Garish commercial strips, uniform housing developments, and poorly sited industrial plants all stand out to many people as environmental problems. But among those whose only opportunity for homeowning is a suburban development, who are served by the facilities in commercial strips, or who look to the industrial plants for jobs and tax revenues, there is often disagreement as to whether these developments are undesirable.

This is not true in other nations. In Europe, a relatively well-understood consensus has evolved historically on what good land use is and on the need for open space, balanced development, and historic preservation. In the United States, the nascent new town movement is one tanglible manifestation of land use concern, apart from sporadic concerns expressed in hearings on local zoning ordinances and variances from them. There is no lack of planning by regional councils, city planning bodies, and even State agencies. But the translation of these plans into new living patterns has not proceeded very far in the present milieu of fragmented local controls.

As concern over the overall quality of the environment increases, interest in land use policy is also on the upswing. But most of this concern still tends to be elitist—planners and other government officials—without broad public participation. The few exceptions are those local issues which center around a particular land use conflict, such as the "Save the Bay" campaign in San Francisco, which was later translated into solid institutional change with the creation of the Bay Conservation and Development Commission. As the public increasingly perceives the nature of land use problems and the fact that improvement is possible, the needed constituency should emerge.

At the State and national level, there has been a growing awareness of the need for a process to deal with land use. The President proposed a National Land Use Policy bill in 1971, which was strengthened by amendments that he submitted in 1972. Bills reflecting many of these proposals have been reported out of the Senate and House Interior Committees. A number of States, such as Maine, Vermont, and Florida, have developed broad land use programs. Although these are hopeful developments, real changes in land use practices and more environmentally sound development will require broad public participation and support. This means support for legislation, public participation in hearings on plans and regulatory controls, and public scrutiny of long-term planning efforts. If the public demands it, developers will have an incentive to build housing that is balanced and attractive, provides open space, and blends with the environment instead of conflicting with it.

The public perception of urban environmental problems is even more uncertain. It is incongruous that millions of Americans go abroad every year to see great cities such as Paris, London, and Vienna while many U.S. cities continue to deteriorate. But there is no consensus on the need to revitalize our urban envronment and make it a place of beauty and exictement. Through urban renewal or other activities, many cities have taken some steps toward revitalization, but success has been mixed at best.

Clearly much more awareness is needed of the dimly understood environmental problems of urban America, and particularly those of the inner city, discussed in last year's Annual Report. Our understanding of the urban environment must be greatly expanded from air and water pollution to the quality of architecture and the vitality of the city in providing entertainment, culture, adequate housing for all its citizens, and a feeling of belonging and excitment.

The interrelationships between the environment and the economy seem to be little understood among the general public. There are still widespread misconceptions of the economic aspects of environmental controls—such as the notion that industrial pollution control costs can somehow be completely absorbed by industries rather than passed along, in whole or in part, to consumers through price increases similar to increased labor or materials costs.

The economics of environmental improvement must be better understood because they affect broad segments of the Nation's population. There will be increased costs for environmental improvements, and the public must be willing to pay for them. If the public is not aware of these costs, disillusion may set in when they are actually incurred. The public must also understand the economic benefits that environmental controls will achieve and the relationship of these benefits to the costs.

As the basic steps toward remedying some of the most blatant environmental problems are taken, such as controls over air and water pollution, public sophistication and perception of some of the more complicated or subtle environmental problems should expand. With broad-scale public understanding and support, the very real gains being made in combating pollution can then be transferred to the equally important job of achieving sensible land use and livable urban areas.

summary

The Council's Third Annual Report shows how entwined environmental quality is with our institutions, our economic systems, the development of our technology, our laws, and indeed our values as a society. It also indicates how little we still know about many aspects of the environment, including its basic physical aspects. Much more needs to be known, for example, about the source and fate of pollutants and the impacts of pollutants and other environmental insults on man and natural resources. This information is critical if we are to develop valid measurement systems, monitoring, and indices of environmental quality.

We need to understand better the environmental impacts which stem from the basic production systems in our society. Systems analysis can generate information both on the causes of our environmental problems and on how our economic system can resolve some of these problems through adequate pricing and incentives. As we better understand how economics can unintentionally lead to environmental damage, we can correct biases in public policy and structure incentives to eliminate or reverse these trends.

As indicated earlier, progress in environmental improvement is visible on many fronts. It appears that we are winning the battle against air pollution. New institutions are being developed, and a wide variety of innovative approaches to environmental problems is being tried at the Federal, State, and local levels. The President has recommended changes in the tax code to abate sulfur oxide emissions and to discourage development in fragile wetland areas. These changes in our institutions, our laws, and our economic system are important steps in achieving the kind of environment that we all seek. Building from these steps, there is every reason to believe that the country can respond to the difficult but rewarding challenge before it.

appendix a

organization and staff of the council on environmental quality

the council

On January 29, 1970, the President nominated Russell E. Train, Chairman, and Robert Cahn and Gordon J. F. MacDonald, members, of the Council on Environmental Quality, Executive Office of the President. They were confirmed by the Senate on February 6.

Mr. Train was formerly Under Secretary of the Interior. From 1965 to 1969 he was president of the Conservation Foundation and has been active in a number of other conservation organizations, both here and abroad. He served on the staffs of congressional committees and headed the Treasury Department's tax legislative staff before being appointed to the Tax Court of the United States, on which he served for eight years. Following the 1968 election, President-elect Nixon appointed him chairman of a special task force on environmental problems.

Mr. Cahn is on leave from the Washington Bureau of The Christian Science Monitor, for which he has been a correspondent since 1965. He was awarded the 1969 Pulitzer Prize for National Reporting for his series of articles on National Parks. He has been a reporter for the Seattle Star, the Pasadena Star-News, and Life magazine; an editor of Collier's and the Saturday Evening Post; and the White House correspondent for the U.S. Information Agency.

Dr. MacDonald is from the University of California at Santa Barbara, where he was vice chancellor for research and graduate affairs since September 1968. He was a member of the President's Science Advisory Committee, 1965-69. For the National Academy of Sciences, he served on the Committee on Atmospheric Sciences, 1961-70; The Space Science Board, 1962-70; and the Environmental Studies Board, 1968-70, part of which period he was the Board Chairman. He has also been chairman of the Executive Committee of the Earth Sciences Division, National Research Council.

program development and evaluation

The Program Development and Federal Impact Evaluation staffs are headed by Alvin L. Alm, Staff Director for Program Development. The Program Development staff is primarily responsible for developing policy proposals through legislation, special reports, task forces, and other means. It also assists in the coordination of Federal environmental policy. Senior staff members are: J. Clarence Davies III, W. Roger Strelow, and Eric R. Zausner. Staff members are: Gerald O. Barney, Joan C. Hock, Joseph L. Meresman, Warren R. Muir, Sheila A. Mulvihill, Steffen Plehn, Stephen Rattien, Phillip E. Schambra, and James L. Trayers. Michael Rawson is staff assistant.

The Federal Impact Evaluation staff is responsible for review and evaluation of Federal activities which have a potential effect on the environment and for policy development relating to such activities. Senior staff member is Steven D. Jellinek. Staff members are: William J. Dircks, Brian P. Jenny, Robert D. Lunt, William Matuszeski, Grace H. Reppert, Stephen Sloan and Richard L. Storch. Staff assistants are Diane L. Donley and Connie A. Musgrove.

general counsel

The General Counsel's office is responsible for review of legislative and regulatory matters coming before the Council, specifically with regard to interpretation and implementation of the National Environmental Policy Act. Timothy Atkeson, General Counsel to the Council, is assisted by William T. Lake, Charles F. Lettow, and Philip E. Soper.

secretary to the council

The Secretary's office is responsible for policy development and coordination with the program development staff. It also oversees primary staff support activities including budget, personnel, and administration. Boyd H. Gibbons III, Secretary to the Council, is assisted by William K. Reilly, senior staff member; Jayne Brumley, Public Information Officer; Willis G. Savage, Administrative Officer; and Dorothy A. Gooding, administrative assistant.

advisors

The technical advisors on the Council staff provide expertise in the areas of science and international affairs. They are: Lee M. Talbot, Senior Scientist on leave from the Smithsonian Institution, and William A. Hayne, International Officer, who is assisted by Henry H. Janin. Francis S. M. Hodsoll, on loan from the Department of State, recently replaced Harry C. Blaney as a special assistant for the Committee on the Challenges of Modern Society. Jack Perry is also on loan from the Department of State as a special assistant for Soviet Affairs.

supportive staff

Marion L. O'Connell, Mary C. Curran, and Marjory D. Bianchi are executive assistants to the chairman, Dr. MacDonald, and Mr. Cahn, respectively. Other staff members are: Elouise Agee, Julia Alessio, Margaret Battle, Terry S. Bernhardt, Vicki L. Boyd, Bernice J. Carney, Olga S. Chamerys, Joyce Cox, Odelia L. Doggette, Elizabeth A. Ference, Mary Ann Ferguson, Barbara N. Gray, Margaret M. Gugino, Anna Hagenberger, Joanne V. Kennedy, Margaret Kennedy, Anna M. Klocke, Barbara A. Luckett, Betty Marshall, Muriel L. Montgomery, N. Jayne Parker, Janet Peck, Barbara E. Sargeant, Katherine R. Soaper, Thomas Walker, and Norma L. Williams.

summer interns

With the Council for the summer of 1972 are: Bruce Adams, Georgetown University Law School; Phillip Arnold, Occidental College; Stephen J. Boatti, Stanford Law School; Susan Brawley, Wellesley College; Robin Breeskin, University of Maryland; Richard Burroughs, Massachusetts Institute of Technology; Laurel Carson, University of Michigan; Jeff Drifmeyer, University of Virginia; David Eaton, University of Pittsburgh; Julia Fish, Boston University; Walter Greenfield, Wharton School of Finance; Mariette Howell, Massachusetts Institute of Technology; Lee Ann Huntington, Stanford University; Bruce MacDonald, Princeton University; Susan May, Smith College; Anne McDonald, Northeastern University; Michael Millenson, Washington University; Joseph Perkowski, Massachusetts Institute of Technology; Douglas Rathe, Northwestern University; Jay Silberman, American University Law School; Kenneth Small, University of California, Berkeley; and Steven Woodbury, University of Pennsylvania.

appendix b

the national environmental policy act of 1969, public law 91-190 january 1, 1970 (42 u.s.c. 4321-4347)

An Act to establish a national policy for the environment, to provide for the establishment of a Council on Environmental Quality, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "National Environmental Policy Act of 1969."

purpose

SEC. 2. The purposes of this Act are: To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality.

title i

declaration of national environmental policy

Sec. 101. (a) The Congress, recognizing the profound impact of man's activity on the interrelations of all components of the natural environment, particularly the profound influences of population growth, high-density urbanization, industrial expansion, resource exploitation, and new and expanding technological advances and recognizing further the critical importance of restoring and maintaining environmental quality to the overall welfare and development of man, declares that it is the continuing policy of the Federal Government, in cooperation with State and local governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.

(b) In order to carry out the policy set forth in this Act, it is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may—

(1) Fulfill the responsibilities of each generation as trustee of the envionment for succeeding generations;

(2) Assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;

(3) Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;

(4) Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice;

(5) Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and

(6) Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

(c) The Congress recognizes that each person should enjoy a healthful environment and that each person has a responsibility to contribute to the preservation and enhancement of the environment.

Sec. 102. The Congress authorizes and directs that, to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and (2) all agencies of the Federal Government shall—

(A) Utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment;

(B) Identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations;

(C) Include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on—

(i) The environmental impact of the proposed action,

(ii) Any adverse environmental effects which cannot be avoided should the proposal be implemented,

(iii) Alternatives to the proposed action,

(iv) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(v) Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environmental Quality and to the public as provided by section 552 of title 5, United States Code, and shall accompany the proposal through the existing agency review processes;

(D) Study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources;

(E) Recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment;

(F) Make available to States, counties, municipalities, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the quality of the environment;

(G) Initiate and utilize ecological information in the planning and development of resource-oriented projects; and

(H) Assist the Council on Environmental Quality established by title II of this Act.

Sec. 103. All agencies of the Federal Government shall review their present statutory authority, administrative regulations, and current policies and procedures for the purpose of determining whether there are any deficiencies or inconsistencies therein which prohibit full compliance with the purposes and provisions of this Act and shall propose to the President not later than July 1, 1971, such measures as may be necessary to bring their authority and policies into conformity with the intent, purposes, and procedures set forth in this Act.

Sec. 104. Nothing in section 102 or 103 shall in any way affect the specific statutory obligations of any Federal agency (1) to comply with criteria or standards of environmental quality, (2) to coordinate or consult with any other Federal or State agency, or (3) to act, or refrain from acting contingent upon the recommendations or certification of any other Federal or State agency.

Sec. 105. The policies and goals set forth in this Act are supplementary to those set forth in existing authorizations of Federal agencies.

title ii
council on environmental quality

Sec. 201. The President shall transmit to the Congress annually beginning July 1, 1970, an Environmental Quality Report (hereinafter referred to as the "report") which shall set forth (1) the status and condition of the major natural, manmade, or altered environmental classes of the Nation, including, but not limited to, the air, the aquatic, including marine, estuarine, and fresh water, and the terrestrial environment, including, but not limited to, the forest, dryland, wetland, range, urban, suburban and rural environment; (2) current and foreseeable trends in the quality, management and utilization of such environments and the effects of those trends on the social, economic, and other requirements of the Nation; (3) the adequacy of available natural resources for fulfilling human and economic requirements of the Nation in the light of expected population pressures; (4) a review of the programs and activities (including regulatory activities) of the Federal Government, the State and local governments, and nongovernmental entities or individuals with particular reference to their effect on the environment and on the conservation, development and utilization of natural resources; and (5) a program for remedying the deficiencies of existing programs and activities, together with recommendations for legislation.

Sec. 202. There is created in the Executive Office of the President a Council on Environmental Quality (hereinafter referred to as the "Council"). The Council shall be composed of three members who shall be appointed by the President to serve at his pleasure, by and with the advice and consent of the Senate. The President shall designate one of the members of the Council to serve as Chairman. Each member shall be a person who, as a result of his training, experience, and attainments, is exceptionally well qualified to analyze and interpret environmental trends and information of all kinds; to appraise programs and activities of the Federal Government in the light of the policy set forth in title I of this Act; to be conscious of and responsive to the scientific, economic, social, esthetic, and cultural needs and interests of the Nation; and to formulate and recommend national policies to promote the improvement of the quality of the environment.

Sec. 203. The Council may employ such officers and employees as may be necessary to carry out its functions under this Act. In addition, the Council may employ and fix the compensation of such experts and consultants as may be necessary for the carrying out of its functions under this Act, in accordance with section 3109 of title 5, United States Code (but without regard to the last sentence thereof).

Sec. 204. It shall be the duty and function of the Council—

(1) To assist and advise the President in the preparation of the Environmental Quality Report required by section 201;

(2) To gather timely and authoritative information concerning the conditions and trends in the quality of the environment both current and prospective, to analyze and interpret such information for the purpose of determining whether such conditions and trends are interfering, or are likely to interfere, with the achievement of the policy set forth in title I of this Act, and to compile and submit to the President studies relating to such conditions and trends;

(3) To review and appraise the various programs and activities of the Federal Government in the light of the policy set forth in title I of this Act for the purpose of determining the extent to which such programs and activities are contributing to the achievement of such policy, and to make recommendations to the President with respect thereto;

(4) To develop and recommend to the President national policies to foster and promote the improvement of environmental quality to meet the conservation, social, economic, health, and other requirements and goals of the Nation;

(5) To conduct investigations, studies, surveys, research, and analyses relating to ecological systems and environmental quality;

(6) To document and define changes in the natural environment, including the plant and animal systems, and to accumu-

late necessary data and other information for a continuing analysis of these changes or trends and an interpretation of their underlying causes;

(7) To report at least once each year to the President on the state and condition of the environment; and

(8) To make and furnish such studies, reports thereon, and recommendations with respect to matters of policy and legislation as the President may request.

Sec. 205. In exercising its powers, functions, and duties under this Act, the Council shall—

(1) Consult with the Citizens' Advisory Committee on Environmental Quality established by Executive Order No. 11472, dated May 29, 1969, and with such representatives of science, industry, agriculture, labor, conservation organizations, State and local governments and other groups, as it deems advisable; and

(2) Utilize, to the fullest extent possible, the services, facilities and information (including statistical information) of public and private agencies and organizations, and individuals, in order that duplication of effort and expense may be avoided, thus assuring that the Council's activities will not unnecessarily overlap or conflict with similar activities authorized by law and performed by established agencies.

Sec. 206. Members of the Council shall serve full time and the Chairman of the Council shall be compensated at the rate provided for Level II of the Executive Schedule Pay Rates (5 U.S.C. 5313). The other members of the Council shall be compensated at the rate provided for Level IV of the Executive Schedule Pay Rates (5 U.S.C. 5315).

Sec. 207. There are authorized to be appropriated to carry out the provisions of this Act not to exceed $300,000 for fiscal year 1970, $700,000 for fiscal year 1971, and $1 million for each fiscal year thereafter.

Approved January 1, 1970.

appendix c

the environmental quality improvement act of 1970, public law 91-224, april 3, 1970 (42 u.s.c. 4371-4374)

title ii—environmental quality (of the water quality improvement act of 1970)

short title

Sec. 201. This title may be cited as the "Environmental Quality Improvement Act of 1970."

findings, declarations, and purposes

Sec. 202. (a) The Congress finds—

(1) That man has caused changes in the environment;

(2) That many of these changes may affect the relationship between man and his environment; and

(3) That population increases and urban concentration contribute directly to pollution and the degradation of our environment.

(b) (1) The Congress declares that there is a national policy for the environment which provides for the enhancement of environmental quality. This policy is evidenced by statutes heretofore enacted relating to the prevention, abatement, and control of environmental pollution, water and land resources, transportation, and economic and regional development.

(2) The primary responsibility for implementing this policy rests with State and local governments.

(3) The Federal Government encourages and supports implementation of this policy through appropriate regional organizations established under existing law.

(c) The purposes of this title are—

(1) To assure that each Federal department and agency conducting or supporting public works activities which affect the environment shall implement the policies established under existing law; and

(2) To authorize an Office of Environmental Quality, which, notwithstanding any other provision of law, shall provide the professional and administrative staff for the Council on Environmental Quality established by Public Law 91–190.

office of environmental quality

Sec. 203. (a) There is established in the Executive Office of the President an office to be known as the Office of Environmental Quality (hereafter in this title referred to as the "Office"). The Chairman of the Council on Environmental Quality established by Public Law 91–190 shall be the Director of the Office. There shall be in the Office a Deputy Director who shall be appointed by the President, by and with the advice and consent of the Senate.

(b) The compensation of the Deputy Director shall be fixed by the President at a rate not in excess of the annual rate of compensation payable to the Deputy Director of the Bureau of the Budget.

(c) The Director is authorized to employ such officers and employees (including experts and consultants) as may be necessary to enable the Office to carry out its functions under this title and Public Law 91–190, except that he may employ no more than 10 specialists and other experts without regard to the provisions of title 5, United States Code, governing appointments in the competitive service, and pay such specialists and experts without regard to the provisions of chapter 51 and subchapter 111 of chapter 53 of such title relating to classification and General Schedule pay rates, but no such specialist or expert shall be paid at a rate in excess of the maximum rate for GS–18 of the General Schedule under section 5330 of title 5.

(d) In carrying out his functions the Director shall assist and advise the President on policies and programs of the Federal Government affecting environmental quality by—

(1) Providing the professional and administrative staff and support for the Council on Environmental Quality established by Public Law 91–190;

(2) Assisting the Federal agencies and departments in appraising the effectiveness of existing and proposed facilities, programs, policies, and activities of the Federal Government, and those specific major projects designated by the President which do not require individual project authorization by Congress, which affect environmental quality;

(3) Reviewing the adequacy of existing systems for monitoring and predicting environmental changes in order to achieve effective coverage and efficient use of research facilities and other resources;

(4) Promoting the advancement of scientific knowledge of the effects of actions and technology on the environment and encourage the development of the means to prevent or reduce adverse effects that endanger the health and well-being of man;

(5) Assisting in coordinating among the Federal departments and agencies those programs and activities which affect, protect, and improve environmental quality;

(6) Assisting the Federal departments and agencies in the development and interrelationship of environmental quality criteria and standards established through the Federal Government;

(7) Collecting, collating, analyzing, and interpreting data and information on environmental quality, ecological research, and evaluation.

(e) The Director is authorized to contract with public or private agencies, institutions, and organizations and with individuals without regard to sections 3618 and 3709 of the Revised Statutes (31 U.S.C. 529; 41 U.S.C. 5) in carrying out his functions.

report

Sec. 204. Each Environmental Quality Report required by Public Law 91–190 shall, upon transmittal to Congress, be referred to each standing committee having jurisdiction over any part of the subject matter of the Report.

authorization

Sec. 205. There are hereby authorized to be appropriated not to exceed $500,000 for the fiscal year ending June 30, 1970, not to exceed $750,000 for the fiscal year ending June 30, 1971, not to exceed $1,250,000 for the fiscal year ending June 30, 1972, and not to exceed $1,500,000 for the fiscal year ending June 30, 1973. These authorizations are in addition to those contained in Public Law 91–190.

Approved April 3, 1970.

the environment. Agencies shall develop programs and measures to protect and enhance environmental quality and shall assess progress in meeting the specific objectives of such activities. Heads of agencies shall consult with appropriate Federal, State and local agencies in carrying out their activities as they affect the quality of the environment.

(b) Develop procedures to ensure the fullest practicable provision of timely public information and understanding of Federal plans and programs with environmental impact in order to obtain the views of interested parties. These procedures shall include, whenever appropriate, provision for public hearings, and shall provide the public with relevant information, including information on alternative courses of action. Federal agencies shall also encourage State and local agencies to adopt similar procedures for informing the public concerning their activities affecting the quality of the environment.

(c) Insure that information regarding existing or potential environment problems and control methods developed as part of research, development, demonstration, test, or evaluation activities is made available to Federal agencies, States, counties, municipalities, institutions, and other entities, as appropriate.

(d) Review their agencies' statutory authority, administering regulations, policies, and procedures, including those relating to loans, grants, contracts, leases, licenses, or permits, in order to identify any deficiencies or inconsistencies therein which prohibit or limit full compliance with the purposes and provisions of the Act. A report on this review and the corrective actions taken or planned, including such measures to be proposed to the President as may be necessary to bring their authority and policies into conformance with the intent, purposes, and procedures of the Act, shall be provided to the Council on Environmental Quality not later than September 1, 1970.

(e) Engage in exchange of data and research results, and cooperate with agencies of other governments to foster the purposes of the Act.

(f) Proceed, in coordination with other agencies, with actions required by section 102 of the Act.

SEC. 3. *Responsibilities of Council on Environmental Quality.* The Council on Environmental Quality shall:

(a) Evaluate existing and proposed policies and activities of the Federal Government directed to the control of pollution and the enhancement of the environment and to the accomplishment of other objectives which affect the quality of the environment. This shall include continuing review of procedures employed in the development and enforcement of Federal standards affecting environmental quality. Based upon such evaluations the Council shall, where appropriate, recommend to the President policies of environmental quality and shall, where appropriate, seek resolution of significant environmental issues.

(b) Recommend to the President and to the agencies priorities among programs designed for the control of pollution and for enhancement of the environment.

(c) Determine the need for new policies and programs for dealing with environmental problems not being adequately addressed.

(d) Conduct, as it determines to be appropriate, public hearings or conferences on issues of environmental significance.

(e) Promote the development and use of indices and monitoring systems (1) to assess environmental conditions and trends, (2) to predict the environmental impact of proposed public and private actions, and (3) to determine the effectiveness of programs of protecting and enhancing environmental quality.

(f) Coordinate Federal programs related to environmental quality.

(g) Advise and assist the President and the agencies in achieving international cooperation for dealing with environmental problems, under the foreign policy guidance of the Secretary of State.

(h) Issue guidelines to Federal agencies for the preparation of detailed statements on proposals for legislation and other Federal actions affecting the environment, as required by section 102(2)(C) of the Act.

(i) Issue such other instructions to agencies, and request such reports and other information from them, as may be required to carry out the Council's responsibilities under the Act.

(j) Assist the President in preparing the annual Environmental Quality Report provided for in section 201 of the Act.

(k) Foster investigations, studies, surveys, research, and analyses relating to (i) ecological systems and environmental quality, (ii) the impact of new and changing technologies thereon, and (iii) means of preventing or reducing adverse effects from such technologies.

Sec. 4. *Amendments of E.O. 11472.* Executive Order No. 11472 of May 29, 1969, including the heading thereof, is hereby amended:

(1) By substituting for the term "the Environmental Quality Council", wherever it occurs, the following: "the Cabinet Committee on the Environment".

(2) By substituting for the term "the Council", wherever it occurs, the following: "the Cabinet Committee".

(3) By inserting in subsection (f) of section 101, after "Budget,", the following: "the Director of the Office of Science and Technology,".

(4) By substituting for subsection (g) of section 101 the following:

"(g) The Chairman of the Council on Environmental Quality (established by Public Law 91-190) shall assist the President in directing the affairs of the Cabinet Committee."

(5) By deleting subsection (c) of section 102.

(6) By substituting for "the Office of Science and Technology", in section 104, the following: "the Council on Environmental Quality (established by Public Law 91–190)".

(7) By substituting for "(hereinafter referred to as the 'Committee')", in section 201, the following: "hereinafter referred to as the 'Citizens' Committee')".

(8) By substituting for the term "the Committee", wherever it occurs, the following: "the Citizens' Committee".

RICHARD NIXON.

THE WHITE HOUSE.

appendix e

the president's message on the environment, february 8, 1972

To the Congress of the United States:

From the very first, the American spirit has been one of self-reliance and confident action. Always we have been a people to say with Henley, "I am the master of my fate * * * the captain of my soul"—a people sure that man commands his own destiny. What has dawned dramatically upon us in recent years, though, is a new recognition that to a significant extent man commands as well the very destiny of this planet where he lives, and the destiny of all life upon it. We have even begun to see that these destinies are not many and separate at all—that in fact they are indivisibly one.

This is the environmental awakening. It marks a new sensitivity of the American spirit and a new maturity of American public life. It is working a revolution in values, as commitment to responsible partnership with nature replaces cavalier assumptions that we can play God with our surroundings and survive. It is leading to broad reforms in action, as individuals, corporations, government, and civic groups mobilize to conserve resources, to control pollution, to anticipate and prevent emerging environmental problems, to manage the land more wisely, and to preserve wildness.

In messages to the Congress during 1970 and 1971 I proposed comprehensive initiatives reflecting the earliest and most visible concerns of the environmental awakening. The new cast of the public mind had to be translated into new legislation. New insights had to have new governmental forms and processes through which to operate. Broadly-based problems—such as air pollution, water pollution and pesticide hazards—had to be dealt with first.

The necessary first steps in each of these areas have now been taken though in all of them the work is far from completed. Now, as we press on with that work in 1972, we must also come to grips with the basic factors which underlie our more obvious environmental problems—factors like the use of land and the impact of incentives or disincentives built into our economic system. We are gaining an increasingly sophisticated understanding of the way economic, institutional, and legal forces shape our surroundings for good or ill; the next step is learning how to turn such forces to environmental benefit.

Primary responsibility for the actions that are needed to protect and enhance our environment rests with State and local government, consumers, industry, and private organizations of various kinds—but the Federal Government must provide leadership. On the first day of this decade I stated that it is literally now or never for true quality of life in America. Amid much encouraging evidence that it can and will be now, we must not slacken our pace but accelerate it. Environmental concern must crystallize into permanent patterns of thought and action. What began as environmental awakening must mature finally into a new and higher environmental way of life. If we flag in our dedication and will, the problems themselves will not go away. Toward keeping the momentum of awareness and action, I pledge my full support and that of this Administration, and I urgently solicit the continuing cooperation of the Congress and the American people.

two years' agenda

from consideration to action

In my 1971 environmental message, just one year ago today, I sent to the Congress a comprehensive program designed to clean up the problems of the past, and to deal with emerging problems before they become critical. These proposals included:

Regulation of toxic substances.

Comprehensive improvement in pesticide control authority.

Noise control.

Preservation of historic buildings.

Power plant siting.

Regulation of environmental effects of surface and underground mining.

Ocean dumping regulation.

More effective control of water pollution through a greatly expanded waste treatment grant program and strengthened standard-setting and enforcement authorities.

A National Land Use Policy Act.
Substantial expansion of the wilderness system.
Expanded international cooperation.

To date, most of the legislation on this list has been the subject of congressional hearings; most of it has attracted heartening interest and support; but none of it has yet received final congressional action. Last year was, quite properly, a year of consideration of these measures by the Congress. I urge, however, that this be a year of action on all of them, so that we can move on from intention to accomplishment in the important needs they address. Passage of these measures and creation of the unified Department of Natural Resources which I also proposed in 1971—by this 92d Congress—will be essential if we are to have an adequate base for improving environmental quality.

building on the base

As that base is being established, we must move ahead to build wisely and rapidly upon it. I shall outline today a plan for doing that, with initiatives and actions in the following areas:

—Tightening pollution control:
  A Toxic Wastes Disposal Control Act.
  Legislation to control sediment from construction activities.
  An emissions charge to reduce sulfur oxide air pollution.
  Clean energy research and energy conservation measures.
—Making technology an environmental ally:
  Integrated pest management.
  Stepped-up research on noise control.
  Stepped-up research on air pollution effects and measurement.
—Improving land use:
  Expansion and strengthening of the National Land Use Policy Act.
  Protection of wetlands.
—Protecting our natural heritage:
  A ban on use of poisons for predator control on public lands.
  A stronger law to protect endangered species of wildlife.
  Big Cypress National Fresh Water Reserve.
  National Recreation Areas around New York Harbor and the Golden Gate.
  Conversion of 20 additional Federal properties to recreational use.
  18 new Wilderness Areas.
  Regulation of off-road vehicles on Federal lands.
—Expanding international cooperation on the environment:
  Establishment of a United Nations Fund for the Environment.
  Further measures to control marine pollution.
—Protecting children from lead-based paint.
—Enlisting the young:
  President's Environment Merit Awards Program for high schools.

Youth opportunities in the Department of Agriculture Field Scout program.

tightening pollution control

The legislative framework for dealing with our major air pollution problems has become law, and I have made comprehensive recommendations regarding water pollution control. But several problems remain to be addressed which are difficult to deal with under the general pollution control authorities.

disposal of toxic wastes

Increasingly strict air and water pollution control laws and their more effective enforcement have led to greater reliance on land—both surface and underground—for disposal of waste products from the toxic substances being used in ever greater volume and variety in our society. Without adequate controls, such waste disposal may cause contamination of underground and surface waters leading to direct health hazards.

—I propose a Toxic Wastes Disposal Control Act, under which the Environmental Protection Agency would establish Federal guidelines and requirements for State programs to regulate disposal on or under the land of those toxic wastes which pose a hazard to health. The act would provide for Federal enforcement action if a State should fail to establish its own program.

sediment control

Sediment, small particles of soil which enter the water, is the most pervasive water pollution problem which does not come primarily from municipal or industrial sources. Heavy loads of sediment interfere with many beneficial uses of water, such as swimming and water supply, and can change the entire character of an aquatic environment. Many of our great waterways are afflicted with this problem. In our urban areas, a significant amount of sediment comes from construction. However, if proper construction practices are followed, sediment runoff from this source can be greatly reduced.

—I propose legislation calling upon the States to establish, through appropriate local and regional agencies, regulatory programs to control sediment affecting water quality from earth-moving activities such as building and road construction.

The Environmental Protection Agency, together with other Federal agencies, would develop Federal guidelines for appropriate control measures. Federal enforcement would take place in situations where a State failed to implement such a program.

sulfur oxides emissions charge

In my 1971 environmental message, I announced plans to ask for imposition of a charge on sulfur oxides emissions, one of the air pollutants most damaging to human health and property, and vegetation. The Council on Environmental Quality, the Treasury Department and the Environmental Protection Agency have now completed their studies on this measure and have developed the details of an emission charge proposal.

—I propose a charge on sulfur emitted into the atmosphere from combustion, refining, smelting, and other processes.

This charge would begin in 1976 and apply in all regions where the air quality does not meet national standards for sulfur oxides during 1975. The charge would be 15 cents per pound on sulfur emitted in regions where the primary standards—which are designed to be protective of public health—have not been met within the deadline for achievement prescribed in the Clean Air Act. In regions where air quality met the primary standard but exceeded the secondary national standard—designed to protect property, vegetation, and aesthetic values—a charge of 10 cents per pound of sulfur emitted would apply. Areas which reduce emissions sufficiently to meet both primary and secondary air quality standards would be exempt from the emission charge.

This charge is an application of the principle that the costs of pollution should be included in the price of the product. Combined with our existing regulatory authority, it would constitute a strong economic incentive to achieve the sulfur oxides standards necessary to protect health, and then further to reduce emissions to levels which protect welfare and aesthetics.

clean energy generation and conservation

Ours is an energy-based economy, and energy resources are the basis for future economic progress. Yet the consumption of energy-producing fuels contributes to many of our most serious pollution problems. In order to have both environmental quality and an improving standard of living, we will need to develop new clean energy sources and to learn to use energy more efficiently.

Our success in meeting energy needs while preventing adverse environmental effects from energy generation and transmission will depend heavily on the state of available technology. In my message to the Congress on energy of last June, I announced a series of steps to increase research on clean and efficient energy production. But further action is needed.

—As part of my new commitment to augment Federal research and development and target it more effectively on solving domestic problems, I have requested in the 1973 budget an additional $88 million for development of a broad spectrum of new technologies for producing clean energy.

In addition to carrying forward the priority efforts I have already announced—the liquid metal fast breeder reactor, pipeline quality gas from coal, and sulfur oxide control technology—the budget provides funds for new or increased efforts on fusion power, solar energy, magnetohydrodynamics, industrial gas from coal, dry cooling towers for power plant waste heat, large energy storage batteries and advanced underground electric transmission lines. These new efforts related to both our immediate and our future energy problems, and are needed to assure adequate supplies of clean energy.

My message on energy also announced several steps that would be taken by the Federal Government to use energy more efficiently and with less environmental harm. One of these steps was issuance by the Secretary of Housing and Urban Development of revised standards for insulation in new federally insured houses. The new standards for single-family structures, which have now been issued through the Federal Housing Administration, reduce the maximum permissible heat loss by about one-third for a typical home. The fuel savings which will result from the application of these new standards will, in an average climate, exceed in 1 year the cost of the additional insulation required.

—I am now directing the Secretary of Housing and Urban Development to issue revised insulation standards for apartments and other multifamily structures not covered by the earlier revision. The new rules will cut maximum permissible heat loss by 40 percent.

The savings in fuel costs after a 5-year period will on the average more than offset the additional construction costs occasioned by these revised standards.

These stricter insulation standards are only one example of administrative actions which can be taken by the Federal Government to eliminate wasteful use of energy. The Federal Government can and must provide leadership by finding and implementing additional ways of reducing such waste.

—I have therefore instructed the Council on Environmental Quality and the Office of Science and Technology, working with other Federal agencies, to conduct a survey to determine what additional actions might be taken to conserve energy in Federal activities.

This survey will look at innovative ways to reduce wasteful consumption of energy while also reducing total costs and undesirable environmental impact.

recycling

Recycling—the techniques which treats many types of solid wastes not as pollutants but as recoverable and reusable "resources out of place"—is an important part of the answer to the Nation's solid waste burden. Last year, at my direction, the General Services Administration began reorienting Government procurement policies to set a strong Federal example in the use of recycled products.

—Because Federal tax policy should also offer recycling incentives, the Treasury Department is clarifying the availability of tax exempt treatment industrial revenue bond financing for the construction of recycling facilities built by private concerns to recycle their own wastes.

the environmental transition

Many environmental problems are influenced by the way our economy operates. Conversely, efforts to improve environmental quality have an impact on the economy. Our national income accounting does not explicitly recognize the cost of pollution damages to health, materials, and aesthetics in the computation of our economic well-being. Many goods and services fail to bear the full costs of the damages they cause from pollution, and hence are underpriced.

Environmental quality requirements will affect many of our industries by imposing new costs on production. We know that these impacts fall unevenly on industries, new and old firms, and on communities, but little concrete data has been available. Contract studies have recently been performed for the Council on Environmental Quality, the Environmental Protection Agency, and the Department of Commerce, under the policy guidance of the Council of Economic Advisers. These initial studies suggest that pollution control costs will result in some price increases, competitive trade disadvantages, and employment shifts. The major impact of these costs will be on older, and usually smaller plants.

As long as we carefully set our environmental goals to assure that the benefits we achieve are greater than the social and economic costs, the changes which will occur in our economy are desirable, and we as a nation will benefit from them.

making technology an environmental ally

The time has come to increase the technological resources allocated to the challenges of meeting high-priority domestic needs. In my state of the Union message last month, I announced an expanded Federal research and development commitment for this purpose. There is great potential for achievement through technology in the fight against pollution and the larger drive for quality in our environment.

The temptation to cast technology in the role of ecological villain must be resisted—for to do so is to deprive ourselves of a vital tool available, for enhancing environmental quality. As Peter Drucker has said, "the environment is a problem of [the] success" of technological society, by no means a proof of its failure. The difficulties which some applications of technology have engendered might indeed be rectified by turning our backs on the 20th century, but only at a price in privation which we do not want to pay and do not have to pay. There is no need to throw out the baby with the bath water. Technology can and must be wisely applied so that it becomes environmentally self-corrective. This is the standard for which we must aim.

integrated pest management

Chemical pesticides are a familiar example of a technological innovation which has provided important benefits to man but which has also produced unintended and unanticipated harm. New technologies of integrated pest management must be developed so that agricultural and forest productivity can be maintained together with, rather than at the expense of, environmental quality. Integrated pest management means judicious use of selective chemical pesticides in combination with nonchemical agents and methods. It seeks to maximize reliance on such natural pest population controls as predators, sterilization, and pest diseases. The following actions are being taken:

—I have directed the Department of Agriculture, the National Science Foundation, and the Environmental Protection Agency to launch a large-scale integrated pest management research and development program. This program will be conducted by a number of our leading universities.

—I have directed the Department of Agriculture to increase field testing of promising new methods of pest detection and control. Also, other existing Federal pesticide application programs will be examined for the purpose of incorporating new pest management techniques.

—I have directed the Departments of Agriculture and of Health, Education, and Welfare to encourage the development of training and certification programs at appropriate academic institutions in order to provide the large number of crop protection specialists that will be needed as integrated pest management becomes more fully utilized.

—I have authorized the Department of Agriculture to expand its crop field scout demonstration program to cover nearly four million acres under agricultural production by the upcoming growing season

Through this program many unnecessary pesticide applications can be eliminated, since the scouts will be used to determine when pesticide applications are actually needed.

In my message on the environment last February, I proposed a comprehensive revision of our pesticide control laws—a revision which still awaits final congressional action. Also essential to a sound national pesticide policy are measures to ensure that agricultural workers are protected from adverse exposures to these chemicals.

—I am directing the Departments of Labor and Health, Education, and Welfare to develop standards under the Occupational Safety and Health Act to protect such workers from pesticide poisoning.

noise control research

Scientific findings increasingly confirm what few urban dwellers or industrial workers need to be told—that excessive noise can constitute a significant threat to human well-being. The Congress already has before it a comprehensive noise control bill, which I proposed a year ago. A quieter environment cannot simply be legislated into being. We shall also need to develop better methods to achieve our goal.

—I have requested in my 1973 budget a $23 million increase in research and development funds for reducing noise from airplanes. I have also requested new funds for research and development for reducing street traffic noise.

research on air pollution effects and measurement

Our pollution control efforts are based largely on the establishment of enforceable standards of environmental quality. Initial standards have often been based on incomplete knowledge because the necessary information has not been available. Also, the lack of adequate instruments to measure pollution and of models of how pollutants are dispersed has made it difficult to know exactly how much pollution must be controlled in a particular area. We need added research and development to make more precise judgments of what standards should be set and how we can most practically achieve our goals.

—I have requested in my 1973 budget an additional $12 million to increase research on the health effects of air pollution, on regional air pollution modeling, and on improved pollution instrumentation and measurement.

improving land use

In recent years we have come to view our land as a limited and irreplaceable resource. No longer do we imagine that there will always be more of it over the horizon—more woodlands and shorelands and wetlands—if we neglect or overdevelop the land in view. A new maturity is giving rise to a land ethic which recognizes that improper land use affects the public interest and limits the choices that we and our decedents will have.

Now we must equip our institutions to carry out the responsibility implicit in this new outlook. We must create the administrative and regulatory mechanism necessary to assure wise land use and to stop haphazard, wasteful or environmentally damaging development. Some States are moving ahead on their own to develop stronger land-use institutions and controls. Federal programs can and should reinforce this encouraging trend.

national land use policy act

The National Land Use Policy Act, which I proposed to the Congress last year, would provide Federal assistance to encourage the States, in cooperation with local governments, to protect lands which are of critical environmental concern and to control major development. While not yet enacted, this measure has been the subject of much useful debate.

—I propose amendments to this pending National Land Use Policy legislation which would require States to control the siting of major transportation facilities, and impose sanctions on any State which does not establish an adequate land use program.

Under these amendments, the State programs established pursuant to the act would not only have to embody methods for controlling land use around key growth-inducing developments such as highways, airports, and recreational facilities; the States would also have to provide controls over the actual siting of the major highways and airports themselves. The change recognizes the fact that these initial siting decisions, once made, can often trigger runaway growth and adverse environmental effects.

The amendments would further provide that any State that had not established an acceptable land use program by 1975 would be subject to annual reductions of certain Federal funds. Seven percent of the funds allocated under sections of the Airport and Airways Development Act, the Federal-Aid Highway Acts including the Highway Trust Fund, and the Land and Water Conservation Fund, would be withheld in the first year. An additional 7 percent would be withheld for each additional year that a State was without an approved land use program. Money thus withheld from noncomplying States would be allocated among States which did have acceptable programs.

These strong new amendments are necessary in view of the significant effect that Federal programs, particularly transportation programs, have upon land use decisions.

protection of wetlands

The Nation's coastal and estuarine wetlands are vital to the survival of a wide variety of fish and wildlife; they have an important function in controlling floods and tidal forces; and they contain some of the most beautiful areas left on this continent. These same lands, however, are often some of the most sought-after for development. As a consequence, wetland acreage has been declining as more and more areas are drained and filled for residential, commercial, and industrial projects.

My National Land Use Policy Act would direct State attention to these important areas by defining wetlands among the environmentally critical areas which it singles out for special protection, and by giving priority attention to the coastal zones. I propose to supplement these safeguards with new economic disincentives to further discourage unnecessary wetlands development.

—I propose legislation to limt applicability of certain Federal tax benefits when development occurs in coastal wetlands.

management of public lands

During 1971, I acted to strengthen the environmental requirements relating to management and use of the Nation's vast acreage of federally-owned public lands administered by the Department of the Interior. I proposed new legislation to establish an overall management policy for these public lands, something which we have been without for far too long. This legislation, still pending before the

Congress, would direct the Secretary of the Interior to manage our public lands in a manner that would protect their environmental quality for present and future generations. The policy which it would establish declares the retention of the public lands to be in the national interest except where disposal of particular tracts would lead to a significant improvement in their management, or where the disposal would serve important public objectives which cannot be achieved on nonpublic lands.

protecting our natural heritage

Wild places and wild things constitute a treasure to be cherished and protected for all time. The pleasure and refreshment which they give man confirm their value to society. More importantly perhaps, the wonder, beauty, and elemental force in which the least of them share suggest a higher right to exist—not granted them by man and not his to take away. In environmental policy as anywhere else we cannot deal in absolutes. Yet we can at least give considerations like these more relative weight in the seventies, and become a more civilized people in a healthier land because of it.

predator control

Americans today set high value on the preservation of wildlife. The old notion that the only good predator is a dead one is no longer acceptable as we understand that even the animals and birds which sometimes prey on domesticated animals have their own value in maintaining the balance of nature.

The widespread use of highly toxic poisons to kill coyotes and other predatory animals and birds is a practice which has been a source of increasing concern to the American public and to the Federal officials responsible for the public lands.

Last year the Council on Environmental Quality and the Department of the Interior appointed an Advisory Committee on Predator Control to study the entire question of predator and related animal control activities. The committee found that persistent poisons have been applied to range and forest lands without adequate knowledge of their effects on the ecology or their utility in preventing losses to livestock. The large-scale use of poisons for control of predators and field rodents has resulted in unintended losses of other animals and in other harmful effects on natural ecosystems. The committee concluded that necessary control of coyotes and other predators can be accomplished by methods other than poisons.

Certainly, predators can represent a threat to sheep and some other domesticated animals. But we must use more selective methods of control that will preserve ecological values while continuing to protect livestock.

—I am today issuing an Executive order barring the use of poisons for predator control on all public lands. (Exceptions will be made only for emergency situations.) I also propose legislation to shift the emphasis of the current direct Federal predator control program to one of research and technical and financial assistance to the States to help them control predator populations by means other than poisons.

endangered species

It has only been in recent years that efforts have been undertaken to list and protect those species of animals whose continued existence is in jeopardy. Starting with our national symbol, the bald eagle, we have expanded our concern over the extinction of these animals to include the present list of over 100. We have already found, however, that even the most recent act to protect endangered species, which dates only from 1969, simply does not provide the kind of management tools needed to act early enough to save a vanishing species. In particular, existing laws do not generally allow the Federal Government to control shooting, trapping, or other taking of endangered species.

—I propose legislation to provide for early identification and protection of endangered species. My new proposal would make the taking of endangered species a Federal offense for the first time, and would permit protective measures to be undertaken before a species is so depleted that regeneration is difficult or impossible.

migratory species

The protection of migratory species, besides preserving wildlife values, exemplifies cooperative environmental effort among the United States, Canada, and Mexico. By treaties entered into among these three countries, migratory species are protected. New species may be added by common agreement between the United States and Mexico.

—I have authorized the Secretary of State, in conjunction with the Secretary of the Interior, to seek the agreement of the Mexican Government to add 33 new families of birds to the protected list.

Included in the proposal are eagles, hawks, falcons, owls, and many of the most attractive species of wading birds. I am hopeful that treaty protection can be accorded them in the near future.

big cypress national fresh water reserve

After careful review of the environmental significance of the Big Cypress Swamp in Florida, particularly of the need for water from this source to maintain the unique ecology of Everglades National Park, I directed the Secretary of the Interior to prepare legislation to create the Big Cypress National Fresh Water Reserve. This legislation, which has now been submitted to the Congress, will empower the Federal Government to acquire the requisite legal interest in 547,000 acres of Big Cypress.

new parklands at the gateways

The need to provide breathing space and recreational opportunities in our major urban centers is a major concern of this administration. Two of the Nation's major gateways to the world—New York City and San Francisco—have land nearby with exceptional scenic and recreational potential, and we are moving to make that land available for people to enjoy. In May of 1971, I proposed legislation to authorize a Gateway National Recreation Area in New York and New Jersey. This proposal would open to a metropolitan region of more than 14 million people a national recreation area offering more than 23,000 acres of prime beaches, wildlife preserves, and historical attractions including the Nation's oldest operating lighthouse.

On our western shore lies another area uniquely appropriate for making recreational and scenic values more accessible to a metropolitan community.

—I propose legislation to establish a Golden Gate National Recreation Area in and around San Francisco Bay.

This proposal would encompass a number of existing parks, military reservations, and private lands to provide a full range of recreation experiences. Altogether, the area would encompass some 24,000 acres of fine beaches, rugged coasts, and readily accessible urban parklands, extending approximately 30 miles along some of America's most beautiful coastline north and south of Golden Gate Bridge. Angel and Alcatraz Islands in the bay would be within the boundaries of the national receration area, as would a number of properties on the mainland which afford magnificent views of the city, the bay and the ocean. As part of this plan, I am directing that the Presidio at San Francisco be opened for dual military and civilian recreational uses.

converting federal properties to parks

Among the most important legacies that we can pass on to future generations is an endowment of parklands and recreational areas that will enrich leisure opportunities and make the beauties of the earth and sea accessible to all Americans. This is the object of our legacy of parks program, initiated early in 1971. As part of this program, I directed the Property Review Board to give priority to potential park and recreation areas in its search for alternative uses of federally held real property. The results of this search so far have been most encouraging. To the original 40 properties which I announced in my environmental message of 1971 as being well suited for park use, another 111 prospects have been added. And from this total of 151 prospective parklands, 63 have already been made available.

—Today I am pleased to announce that 20 more parcels of Federal land are being made available for park and recreation use.

These newest parcels, combined with those which have been announced over the past year, provide a legacy of 83 parklands for

America which comprise 14,585 acres in 31 States and Puerto Rico. The estimated fair market value of these properties is over $56 million. In the months to come, every effort will be made to extend this legacy to all 50 States. The green spaces and natural retreats that we tend to take for granted will not be available for future enjoyment unless we act now to develop and protect them.

wilderness areas

One of the first environmental goals I set when I took office was to stimulate the program to identify and recommend to the Congress new wilderness areas. Although this program was behind schedule at that time, I am now able to report that the September 1974 statutory deadline for reviews can and will be met.

The Wilderness Act of 1964 set aside 54 acres, consisting of about 9.1 million acres, as the nucleus of our wilderness system. Since then, 33 new areas totaling almost 1.2 million acres within national forests, national parks, and national wildlife refuges have been added to the system. Thirty-one areas totaling about 3.6 million acres, including 18 areas submitted by this administration, have been proposed to the Congress but have yet to be acted upon. One of the most significant elements of this process has been the active participation by the public in all of its phases. At public wilderness hearings held all across the country, fair consideration has been given to all interests and points of view, with constructive citizen involvement in the decisionmaking process.

—I am today proposing 18 new wilderness areas which, when approved, will add another 1.3 million acres to the wilderness system.

Eight of these proposals are within the national forests, four are within national park areas, and six are in national wildlife refuges.

Of these areas, 1.2 million acres would be in the following national forests: Blue Range National Forest, Ariz. and N. Mex.; Agua Tibia and Emigrant National Forests, Calif.; Eagles Nest and Weminuche National Forests, Colo.; Mission Mountains National Forest, Mont.; Aldo Leopold National Forest, N. Mex.; and Glacier National Forest, Wyo.

A total of 40,000 acres would be in our national park system in the following locations: Black Canyon of the Gunnison National Monument, Colo.; Bryce Canyon National Park, Utah; Chiricahua National Monument, Ariz.; Colorado National Monument, Colo.

Finally, a total of 87,000 acres would be in areas administered by the Fish and Wildlife Services of the Department of the Interior in the following locations: St. Marks, National Wildlife Refuge, Fla.; Wolf Island, National Wildlife Refuge, Ga.; Moosehorn National Wildlife Refuge, Maine; San Juan Islands, National Wildlife Refuge, Wash.; Cape Romain, National Wildlife Refuge, S.C.; and Bosque del Apache, National Wildlife Refuge, N. Mex.

The year 1972 can bring some of the greatest accomplishment in wilderness preservation since passage of the Wilderness Act in 1964.

I urge prompt and systematic consideration by the Congress of these 18 new proposals and of the 31 currently pending before it. Approval of all 49 additions would bring the system up to a total of over 15 million acres.

Unfortunately, few of these wilderness areas are within easy access of the most populous areas of the United States. The major purpose of my legacy of parks program is to bring recreation opportunities closer to the people, and while wilderness is only one such opportunity, it is a very important one. A few of the areas proposed today or previously are in the eastern sections of the country, but the great majority of wilderness areas are found in the West. This of course is where most of our pristine wild areas are. But a greater effort can still be made to see that wilderness recreation values are preserved to the maximum extent possible, in the regions where most of our people live.

—I am therefore directing the Secretaries of Agriculture and the Interior to accelerate the identification of areas in the Eastern United States having wilderness potential.

off-road vehicles

A recent study by the Department of the Interior estimated that Americans own more than 5 million off-road recreational vehicles—motorcycles, minibikes, trail bikes, snowmobiles, dune-buggies, all-terrain vehicles, and others. The use of these vehicles is dramatically on the increase: Data show a three-fold growth between 1967 and 1971 alone.

As the number of off-road vehicles has increased, so has their use on public lands. Too often the land has suffered as a result. Increasingly, Federal recreational lands have become the focus of conflict between the newer motorized recreationist and the traditional hiker, camper, and horseback rider. In the past, Federal land-management agencies have used widely varying approaches to dealing with this conflict. The time has come for a unified Federal policy toward use of off-road vehicles on Federal lands.

—I have today signed an Executive order directing the Secretaries of Agriculture, Interior, Army, and the Board of Directors of the Tennessee Valley Authority to develop regulations providing for control over the use of off-road vehicles on Federal lands.

They will designate areas of use and nonuse, specify operating conditions that will be necesary to minimize damage to the natural resources of the Federal lands, and insure compatibility with other recreational uses, taking into account noise and other factors.

expanding international cooperation on the environment

We are now growing accustomed to the view of our planet as seen from space—a blue and brown disk shrouded in white patches of clouds. But we do not ponder often enough the striking lesson it teaches about the global reach of environmental imperatives. No matter what else divides men and nations, this perspective should unite them. We must work harder to foster such world environmental consciousness and shared purpose.

united nations conference on the human environment

To cope with environmental questions that are truly international, we and other nations look to the first world conference of governments ever convened on this subject: the United Nations Conference on the Human Environment, to be held in Stockholm, Sweden, in June of this year. This should be a seminal event of the international community's attempt to cope with these serious, shared problems of global concern that transcend political differences.

But efforts to improve the global environment cannot go forward without the means to act.

—To help provide such means, I propose that a voluntary United Nations Fund for the Environment be established, with an initial funding goal of $100 million for the first 5 years.

This Fund would help to stimulate international cooperation on environmental problems by supporting a centralized coordination point for U.N. activities in this field. It would also help to bring new resources to bear on the increasing number of worldwide problems through activities such as monitoring and cleanup of the oceans and atmosphere.

—If such a Fund is established, I will recommend to the Congress that the United States commit itself to provide its fair share of the Fund on a matching basis over the first 5 years.

This level of support would provide start-up assistance under mutually agreed-upon terms. As these programs get underway, it may well be that the member nations will decide that additional resources are required. I invite other nations to join with us in this commitment to meaningful action.

control of marine pollution

Ocean pollution is clearly one of our major international environmental problems. I am gratified that in the past year the Congress has taken several steps to reduce the risks of oil spills on the high seas. However, further congressional action is needed to ratify several pending international conventions and to adopt implementing legislation for the various oil-spill conventions which have been ratified or which are awaiting approval.

Action on these recommendations will complete the first round of international conventions to deal with marine pollution. We have taken initiatives in three international forums to develop a second and more sophisticated round of agreements in this area. We are preparing for a 1973 Intergovernmental Maritime Consultative Organization (IMCO) Conference to draft a convention barring intentional discharges to the sea of oil and hazardous substances from ships.

In conjunction with the Law of the Sea Conference scheduled for 1973, we are examining measures to control the effects of developing undersea resources. And, in the preparatory work for the 1972 U.N. Conference on the Human Environment, progress has been made on an agreement to regulate the ocean dumping of shore-generated wastes, and further work in this area has been scheduled by IMCO. We hope to conclude conventions in each of these areas by 1973.

protecting children from lead-based paint

To many Americans, "environment" means the city streets where they live and work. It is here that a localized but acutely dangerous type of "pollution" has appeared and stirred mounting public concern.

The victims are children: the hazard is lead-based paint. Such paint was applied to the walls of most dwellings prior to the 1950's. When the paint chips and peels from the walls in dilapidated housing, it is frequently eaten by small children. This sometimes results in lead poisoning which can cause permanent mental retardation and occasionally death. We can and must prevent unnecessary loss of life and health from this hazard, which particularly afflicts the poorest segments of our population.

To help meet the lead-paint threat, the Department of Health, Education, and Welfare will administer grants and technical assistance to initiate programs in over 50 communities to test children in high-risk areas for lead concentrations. In addition, these programs will support the development of community organization and public education to increase public awareness of the hazard. Other Federal agencies are also active in the effort to combat lead-based paint poisoning. ACTION and other volunteers will assist city governments to help alleviate lead paint hazards. The Department of Housing and Urban Development is engaged in research and other actions to detect and eliminate this hazard.

The resources of the private sector should also be utilized through local laws requiring owners of housing wherever possible to control lead paint hazards.

enlisting the young

The starting point of environmental quality is in the hearts and minds of the people. Unless the people have a deep commitment to the new values and a clear understanding of the new problems, all our laws and programs and spending will avail little. The young, quick to commit and used to learning, are gaining the changed outlook fastest of all. Their enthusiasm about the environment spreads with a healthy contagion: their energy in its behalf can be an impressive force for good.

Four youth participation programs of mutual benefit to the young and the Nation are now planned or underway:

Last October, I initiated the environmental merit awards program. This program, directed by the Environmental Protection Agency in cooperation with the U.S. Office of Education, awards national recognition to successful student projects leading to environmental understanding or improvement. Qualifications for the awards are determined by a local board consisting of secondary school students, faculty, and representatives of the local community. Already more than 2,000 high schools, representing all 50 States, have registered in the program.

The Department of Agriculture's expanded field scout demonstration program, designed to permit more effective pest control with less reliance on chemical pesticides, will employ thousands of high school and college students. These young people will be scouting cotton and tobacco pests in the coming growing season, and the program will be expanded to other crops in future years.

The Environmental Protection Agency has recently initiated in its Seattle regional office a pilot program using young people to assist the agency in many of its important tasks, including monitoring. EPA is working with State and local pollution control agencies to identify monitoring needs. ACTION and the youth training programs are providing the manpower. If this initial program proves successful, the concept will be expanded.

ACTION volunteers and young people employed through the Neighborhood Youth Corps, Job Corps, and college work-study programs will work with city governments to help alleviate lead paint hazards, gaining experience in community health work as they give urgently needed aid to inner-city families.

Young people working on environmental projects, learning the skills necessary for a particular job, must also understand how their work relates to the environmental process as a whole. Thus, all of these activities must be supplemented by continued improvement in many aspects of environmental education to help all of our citizens, both young and old, develop a better awareness of man's relation to his environment. In my first Enviromental Quality Report, I stressed the importance of improving the Nation's "environmental literacy." This goal remains as important as ever, and our progress toward it must continue.

one destiny

Our destiny is one: this the environmental awakening has taught America in these first years of the seventies. Let us never forget, though, that it is not a destiny of fear, but of promise. As I stated last August in transmitting the Second Annual Report of the Council on Environmental Quality: "The work of environmental improvement is a task for all our people . . . The achievement of that goal will challenge the creativity of our science and technology, the enterprise and adaptability of our industry, the responsiveness and sense of balance of our political and legal institutions, and the resourcefulness and the capacity of this country to honor those human values upon which the quality of our national life must ultimately depend." We shall rise to the challenge of solving our environmental problems by enlisting the creative energy of all of our citizens in a cause truly worthy of the best that each can bring to it.

While we share our environmental problems with all the people of the world, our industrial might, which has made us the leader among nations in terms of material well-being, also gives us the responsibility of dealing with environmental problems first among the nations. We can be proud that our solutions and our performance will become the measure for others climbing the ladder of aspirations and difficulties; we can set our sights on a standard that will lift their expectations of what man can do.

The pursuit of environmental quality will require courage and patience. Problems that have been building over many years will not yield to facile solutions. But I do not doubt that Americans have the wit and the will to win—to fulfill our brightest vision of what the future can be.

RICHARD NIXON.

The White House
February 8, 1972

appendix f

excerpt from the president's state of the union message, january 20, 1972

protecting the environment

A central theme of both my earlier messages on the state of the Union was the state of our environment—and the importance of making our peace with nature. The last few years have been a time in which environmental values have become firmly embedded in our attitudes—and in our institutions.

At the Federal level, we have established a new Environmental Protection Agency, a new Council on Environmental Quality, and a new National Oceanic and Atmospheric Administration, and we have proposed an entire new Department of Natural Resources.

New air quality standards have been set, and there is evidence that the air in many cities is becoming less polluted.

Under authority granted by the Refuse Act of 1899, we have instituted a new permit program which, for the first time, allows the Federal Government to inventory all significant industrial sources of water pollution and to specify required abatement actions. Under the Refuse Act, more than 160 civil actions and 320 criminal actions to stop water pollution have been filed against alleged polluters in the last 12 months.

Major programs have also been launched to build new municipal waste treatment facilities, to stop pollution from Federal facilities, to expand our wilderness areas, and to leave a legacy of parks for future generations.

Our outlays for inner city parks have been significantly expanded, and 62 Federal tracts have been transferred to the States and to local governments for recreational uses. In the coming year, I hope to transfer to local park use much more Federal land which is suitable for recreation but which is now underutilized. I trust the Congress will not delay this process.

need for action

The most striking fact about environmental legislation in the early 1970's is how much has been proposed and how little has been enacted. Of the major legislative proposals I made in my special message to the Congress on the environment last winter, 18 are still awaiting final action. They include measures to regulate pesticides and toxic substances, to control noise pollution, to restrict dumping in the oceans, in coastal waters, and in the Great Lakes, to create an effective policy for the use and development of land, to regulate the siting of powerplants, to control strip mining, and to help achieve many other important environmental goals. The unfinished agenda also includes our National Resource Land Management Act, and other measures to improve environmental protection on federally owned lands.

The need for action in these areas is urgent. The forces which threaten our environment will not wait while we procrastinate. Nor can we afford to rest on last year's agenda in the environmental field. For as our understanding of these problems increases, so must our range of responses. Accordingly, I will soon be sending to the Congress another message on the environment that will present further administrative and legislative initiatives. Altogether our new budget will contain more than three times as much money for environmental programs in fiscal year 1973 as we spent in fiscal year 1969. To fail in meeting the environmental challenge, however, would be even more costly.

I urge the Congress to put aside narrow partisan perspectives that merely ask whether we should act to protect the environment and to focus instead on the more difficult question on how such action can most effectively be carried out.

abundant clean energy

In my message to the Congress on energy policy, last June, I outlined additional steps relating to the environment which also merit renewed attention. The challenge, as I defined it, is to produce a sufficient supply of energy to fuel our industrial civilization and at the same time to protect a beautiful and healthy environment. I am convinced that we can achieve both these goals, that we can respect our good earth without turning our back on progress.

In that message last June, I presented a long list of means for assuring an ample supply of clean energy—including the liquid metal fast breeder reactor—and I again emphasize their importance. Because it often takes several years to bring new technologies into use in the energy field, there is no time for delay. Accordingly, I am including in my new budget increased funding for the most promising of these and other clean energy programs. By acting this year, we can avoid having to choose in some future year between too little energy and too much pollution.

appendix g

federal environmental program budgets*

This analysis identifies Federal funding for selected environmental activities in three selected categories:

Pollution control and abatement activities;
Selected activities to protect and enhance the environment; and
Activities to understand, describe and predict environmental conditions.

Information is also included on Federal assistance for sewer and water system construction.

pollution control and abatement

The Federal Government's commitment for programs to control and abate pollution has grown dramatically over the past few years.

[In millions of dollars]

	1969 estimate	1970 actual	1971 actual	1972 estimate	1973 estimate
Budget authority	775	1,432	1,823	3,258	3,419
Obligations	830	1,071	2,017	3,288	3,612
Outlays	685	751	1,149	1,975	2,440

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*Office of Management and Budget, Special Analyses: Budget of the U.S. Government, fiscal year 1973, pp. 296–309 [Special analysis S] (1972).

Budget authority being requested in 1973 is more than four times that appropriated in 1969. Obligations also reflect more than a fourfold increase and outlays more than a threefold increase over the same 4-year period.

The largest portion of funding is for grants to State and local governments for construction of municipal sewage treatment facilities. The number of individuals served by secondary sewage treatment facilities has grown from 91 million in 1969 to 103 million in 1971 and is expected to reach 115 million by 1973, 130 million by 1975 and 146 million by 1977. Largely because of construction backlog, there currently is about $7 billion worth of waste treatment facilities for which Federal assistance has been committed for which construction is incomplete or not yet under contract. This backlog does not include funds becoming available for obligation in 1972 or those requested for 1973.

Grants also provide support for pollution control agency operations and for planning. Outlays for all grants will increase by 23 percent over 1972, from $1,014 million to $1,250 million.

Table S-1.

Pollution Control and Abatement Activities

[In millions of dollars]

Type of activity	Budget authority			Outlays		
	1971 actual	1972 estimate	1973 estimate	1971 actual	1972 estimate	1973 estimate
Financial aid to State and local governments	1,802	2,121	2,123	554	1,014	1,250
Research and development	442	516	599	366	474	561
Federal abatement and control operations	136	198	219	92	189	206
Manpower development	19	18	15	17	18	14
Reduced pollution from Federal facilities	116	280	315	74	186	272
Other pollution control and abatement activities	49	124	113	45	94	115
Separate transmittal [1]	....	....	35	....	....	22
Total	**2,564**	**3,258**	**3,419**	**1,149**	**1,975**	**2,440**

[1] Not reflected in preceding activity lines are proposals that will be transmitted subsequently for an estimated $35 million in budget authority and $22 million in outlays in 1973 for EPA for implementing legislation proposed by the administration.

Outlays will also increase by 18 percent, from $474 million to $561 million, for research and development activities, which include efforts to determine and describe pollution sources and effects and to develop and demonstrate technology for monitoring and controlling pollution.

Outlays for direct Federal pollution control operations will increase by 9 percent, from $189 million to $206 million. This includes planning; monitoring and surveillance; standard setting and enforcement; and technical assistance. Funding for manpower development activities will decline somewhat, reflecting the steady growth in the number of people interested in and available for positions in environmental activities.

Outlays will increase by 46 percent in 1973, from $186 million to $272 million, primarily in the Departments of Defense and Agriculture for remedial projects to reduce pollution from Federal facilities.

agencies involved—Major Federal activities to control and abate pollution were consolidated in the Environmental Protection Agency (EPA) on December 2, 1970. However, a number of other agencies carry on important pollution control activities, as indicated in table S-2.

Table S-2.

Pollution Control and Abatement Activities—by Agency

[In millions of dollars]

Agency	Budget authority			Outlays		
	1971 actual	1972 estimate	1973 estimate	1971 actual	1972 estimate	1973 estimate
Environmental Protection Agency [1]	1,303	2,448	2,481	718	1,287	1,544
Defense—Military	134	214	314	82	130	235
Atomic Energy Commission	124	139	158	122	136	154
Transportation	52	66	91	22	56	79
Agriculture	71	108	106	67	107	139
Defense—Civil	8	50	56	7	50	56
Interior	46	104	87	45	87	82
Commerce	25	30	34	20	26	30
General Services Administration	4	18	....	2	2	5
National Aeronautics and Space Administration	25	33	29	25	30	29
National Science Foundation	10	12	16	9	11	15
Other agencies	22	37	46	31	53	72
Total	**1,823**	**3,258**	**3,419**	**1,149**	**1,975**	**2,440**

[1] Funding shown above for EPA has been adjusted to include activities actually carried on by the Departments of HEW, Agriculture, and Interior; AEC and Federal Radiation Council prior to December 2, 1970. The budget authority adjustment is $14 million in 1971 and the outlay adjustment is $17 million.

Outlays for EPA will increase by 20 percent in 1973, from $1,287 million to $1,544 million. Continued emphasis will be placed on EPA's program of grants for sewage treatment facilities to assist

State and localities in reducing the Nation's backlog of municipal treatment facility needs. Grants up to 55 percent of total eligible project costs are made to construct municipal sewage treatment facilities. Appropriations for this program were $214 million in 1969, $800 million in 1970, $1 billion in 1971, and $2 billion in 1972. Another $2 billion is being requested for 1973.

Several new efforts will be undertaken by EPA to define pollution control objectives and determine the most cost-effective solutions. Research will be expanded in health effects of air pollution to determine more accurately the concentrations of pollutants that are dangerous to human health, and in urban-regional scale modeling of relationships among air pollution emissions, atmospheric conditions, and air to which segments of the population are exposed. EPA is reorienting its solid waste activities to focus upon economic and institutional constraints, with less attention to areas where the private sector is focusing its efforts—the development of hardware for recycling and other waste management activities. In addition, funding will be increased for State and local pollution control agency grants, enforcement activities, air pollution monitoring, and economic studies. The Congress has yet to complete action on legislation proposed for EPA by the administration on noise control, toxic substances, ocean dumping, pesticides, and water quality.

Other agencies also carry out important pollution control and abatement activities. For example, the Department of Defense will continue to expand its R. & D. and action programs to reduce pollution from its industrial production facilities, military bases, naval vessels, aircraft, and jet engine test facilities. Accomplishments include development of a new process for disposal of deteriorated explosives, development of biodegradable metal cleaners, reduction of smoke levels in propellants, and the development of a low pollution engine that is now being tested for use in automobiles.

The Atomic Energy Commission will continue its major program of research, development, and monitoring relating to effects of ionizing radiation. Increases in 1973 are largely for research on the effects of thermal alteration of lakes, streams, and estuaries and to provide information on the amount and nature of radioactivity and other potential pollutants released to the environment.

The Department of Agriculture makes grants and loans for waste treatment facilities in smaller localities and conducts research on agriculturally related pollution such as pesticides, animal and crop processing wastes and fertilizer and plant nutrients. Progress has been made in reducing pollution from facilities in national forests by a minimization of stream pollution and sediment, and prevention of logging residue disposition in stream channels.

The Department of the Interior will continue research relating to pollution sources and effects, will expand activities to reduce pollution from facilities in the national parks, and will increase research under pilot plant programs to develop methods of converting coal to fuel gas with less pollution.

The Corps of Engineers will continue construction of dikes for the containment of polluted material dredged from Great Lakes harbors.

The Department of Transportation will increase funding for work on reducing aircraft engine noise, studying environmental effects of aircraft, and reducing pollution from Coast Guard facilities.

The Department of Commerce provides grants for waste treatment facilities from the Economic Development Administration. The National Oceanic and Atmospheric Administration conducts environmental monitoring and prediction activities related to air and water pollution. The National Bureau of Standards defines and tests environmental standards and measurements.

The General Services Administration will continue work on pollution reduction at Federal installations using funds appropriated in previous years.

The National Aeronautics and Space Administration activities consist primarily of research and development on reduction of aircraft noise.

media polluted and pollutants—Pollution control and abatement activities are generally focused on reducing a variety of pollutants in air or water or particular classes of pollutants such as pesticides or radiation. Table S–3 summarizes the total Federal effort in terms of

Table S–3

Pollution Control and Abatement Activities—By Media or Pollutant

[In millions of dollars]

Media or pollutant	Obligations		
Media polluted:	1971 actual	1972 estimate	1973 estimate
Water:			
Construction grants and loans	1,285	2,052	2,176
Other	248	487	510
Air	245	433	506
Land	49	60	64
Other (e.g., living things, materials)	136	194	246
Multimedia (i.e., more than one of above)	53	63	74
Total [1]	**2,017**	**3,288**	**3,577**
Selected pollutants: [2]			
Solid wastes	46	61	64
Pesticides	36	48	51
Radiation	137	144	152
Noise	41	57	61

[1] Excludes $35 million in 1973 for EPA which will be proposed in a separate transmittal (see footnote for table S–1).

[2] Funds for selected pollutants are *included* in the "media" breakdown above.

media polluted and also identifies funding associated with selected pollutants. Among the media, water pollution currently receives the greatest share—75 percent—of total Federal pollution control obligations. This large share is a result of grants and loans for construction of municipal waste treatment facilities.

Air pollution control efforts account for 14 percent of the total. Federal efforts in 1973 include research and development, grants to State and local air pollution control agencies, and direct Federal operations such as monitoring, standard setting, and enforcement. Increased emphasis will be given in 1973 to improving knowledge of the health related effects of various concentrations of pollutants; and quantifying the health benefits that would result from their control. Activities relating to pollution of land are for research and other activities concerned with effects of acid mine drainage, nutrients, pesticides, and other substances.

Federal pollution control activities relating to radiation, pesticides, solid wastes, and noise are largely confined to research relating to effects, control technology, and standard setting and enforcement.

Excluded from funding shown above for pollution control and abatement activities are:

- Activities to reduce or avoid the use of pesticides funding for such activity is expected to be approximately $66 million in 1973, up from $57 million in 1972 for both research and education programs largely carried out by the Department of Agriculture; and
- Activities that are carried on for some other primary purpose but which also contribute to the reduction of pollution. For example, extensive activities to hold soil in place to preserve soil productivity, such as those financed by the Department of Agriculture, and erosion control activities by Corps of Engineers and Department of Transportation (highways), have been excluded from this analysis even though these activities also serve to reduce sediment pollution of water.

recreation, parks, historic sites, fisheries and wildlife preservation, and enhancement activities [1]

Federal funding will increase for environmental protection and enhancement activities such as providing recreational areas, parks, historic sites, and fish and wildlife preservation.

protection and enhancement activities—The Federal Government provides grants to State and local governments for acquiring land for recreational purposes, for preserving open space and historic properties, and for fish and wildlife refuges. Aid is also provided for research and planning, construction and maintenance of recreational facilities and wildlife refuges. Outlays for aid to State and local governments will increase by 10 percent from $272 million in 1972 to $299 million in 1973.

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[1] The content of this category differs from that of the category entitled "Selected environmental enhancement activities" in the 1972 budget special analysis. The principal differences are exclusion of the highway beautification program under DOT and exclusion of the grants made by EDA in Commerce for recreation development projects. Funding data are not available for 1969–70 in areas comparable to 1971–73.

The Federal Government also performs directly such activities as acquiring lands for the preservation of unique natural areas and for recreation, supporting sport fisheries and wildlife preservation activities, preserving historic properties, and conducting related functions.

Environmental protection and enhancement activities include:

- City recreation, which covers all federally assisted or direct Federal projects or activities (including historic preservation) which are located within incorporated places of 25,000 or more population.
- Unique natural areas and endangered species, which covers all national parks, monuments, scenic rivers, trails, wilderness seashore and refuges for endangered species and similar non-Federal areas.
- Noncity general recreation, which covers all national recreation areas, recreation programs in national forests, separable recreation costs for Federal water projects, and federally assisted State and local areas located outside incorporated places of 25,000 or more population.
- Sport fish and wildlife, which covers all national wildlife refuges, national fish hatcheries and federally assisted projects serving similar purposes including rare and endangered species.
- Historic preservation and rehabilitation, which covers all national historic sites, military parks, battlefields, and similar areas and federally assisted historic preservation and rehabilitation.
- All other activities, which includes all Federal aid and direct Federal costs for general administration, planning, studies and similar activities not otherwise allocated.

[In millions of dollars]

	1971 actual	1972 estimate	1973 estimate
Budget authority	870	1,056	962
Obligations	752	1,061	1,017
Outlays	674	887	898

Table S-4.

Selected Environmental Protection and Enhancement Activities

[In millions of dollars]

	Budget authority			Outlays		
	1971 actual	1972 estimate	1973 estimate	1971 actual	1972 estimate	1973 estimate
Financial aid to State and local governments:						
Purchase, development, and operations:						
City recreation	114	151	133	55	90	104
Preserve unique natural areas and protect endangered species	27	36	36	14	23	25
Noncity general recreation	139	188	147	52	86	101
Sport fish and wildlife	51	56	63	45	62	57
Historic preservation and rehabilitation	7	8	10	2	8	10
All other State and local aid	1	3	4	1	2	3
Subtotal	**339**	**442**	**392**	**168**	**272**	**299**
Direct Federal activities:						
Purchase, development, and operations:						
City recreation	33	35	40	30	33	39
Preserve unique natural areas and protect endangered species	96	93	134	78	118	137
Noncity general recreation	231	279	189	227	259	198
Sport fish and wildlife	100	110	111	100	104	123
Historic preservation and rehabilitation	35	56	56	34	60	63
All other direct Federal activity	37	40	41	37	40	40
Subtotal	**531**	**614**	**570**	**506**	**615**	**599**
Total	**870**	**1,056**	**962**	**674**	**887**	**898**

agencies involved—The Department of the Interior accounts for approximately 70 percent of the environmental protection and enhancement activities described in this section.

The Bureau of Outdoor Recreation promotes coordination of Federal outdoor recreation programs, and administers the land and water conservation fund which provide grants for planning, acquisition and development of State and local recreation areas and Federal purchases of nationally important lands. The 1973 budget for the land and water conservation fund continues the President's legacy of parks initiative by providing $197 million for grants to State and local governments to help them meet the increasing demand for local recreation areas, especially those located in or near major cities. The amount for grants in 1972, to launch the legacy of parks initiative, includes appropriation of unused prior year authorization and, therefore, is $58 million higher than the amount in 1973. In 1973, a total of $98 million is provided for Federal land purchases made by several agencies to preserve nationally important natural and historic areas, including endangered species habitats. Newly authorized areas for which funds are provided to continue acquisition in 1973 are Sleeping Bear Dunes National Lakeshore, Voyageurs National Park, Gulf Islands National Seashore, and Chesapeake and Ohio Canal Historic Park. Emphasis will also be placed on acquisition of lands in older natural preservation areas and parks such as Everglades National Park.

The Bureau of Sport Fisheries and Wildlife provides assistance to State and local governments for fish and wildlife restoration, management and research. The Bureau administers 97 hatcheries, which help to support inland fisheries resources, and 329 units in the National Wildlife Refuge System which includes about 28 million acres, of which nearly 20 million acres are in Alaska. Endangered species, including nine mammals, 15 birds, and the alligator, are protected on 82 of the national wildlife refuges. The Bureau manages 256 wildlife refuges with 3.9 million acres for migratory waterfowl and 51 other areas with 4 million acres for other migratory birds.

The National Park Service administers 284 areas comprising about 29 million acres located in 47 States, the District of Columbia, Puerto Rico, and the Virgin Islands. These include national parks, monuments, historic sites, and national recreation areas which have been established to preserve the Nation's natural and historic heritage. In 1973 the Park Service will commence planning and design work for visitor facilities in the Nation's Capital and elsewhere for the American Revolution bicentennial. The Park Service also encourages the preservation of additional historic properties throughout the Nation by assisting the States and territories to conduct statewide historic preservation surveys and by making matching grants for individual preservation projects.

The Bureau of Land Management protects and manages over 450 million acres—mainly in the Western States and Alaska. This land area represents 60 percent of all federally owned lands and 20 percent of America's total land base. Legislation proposed by this administration would establish a national policy that these national resource lands be managed under principles of multiple use and sustained yield in such a way as to protect the quality of the environment. An important ongoing program the bureau administers is the Johnny Horizon antilitter campaign on the public lands. The Bureau of Reclamation provides recreation facilities on some of the reservoir projects which it constructs.

The Department of Housing and Urban Development provides grants to help States and localities acquire and develop open space lands. In 1973, the open space program will be folded into the new urban community development revenue sharing program, upon enactment of pending legislation. Consequently, the $100 million requested in 1973 for the open space program, which is the same as the 1972 appropriation, will be transferred to the revenue sharing program upon its enactment. This will allow increased flexibility for communities to meet recreational needs in their areas.

The Department of Agriculture carries out a variety of environmental enhancement activities, particularly through the Forest Service. The 187 million acres of National Forest System lands are managed in accordance with the provisions of The Multiple Use-Sustained Yield Act to provide outdoor recreation, range, timber, watershed and wildlife values in combinations that will best meet the needs of the Nation without impairing the productivity of the land. A review of all existing primitive areas for possible designation as wilderness is underway in accordance with the provision of the Wilderness Act and a new program in cooperative law enforcement is proposed for implementation in 1972 and 1973. Other activities include research to develop more attractive and durable plants, shrubs, flowers, and trees to improve natural beauty.

The Corps of Engineers provides facilities for water-based recreation at reservoirs and other public works. As of January 1971, these facilities included 3,284 recreation areas providing 2,666 designated day-use areas, 1,391 designated camping areas with over 50,000 campsites.

donations and bargain sales of federal property—Assistance to State and local governments for parks, recreation, and historic preservation also is provided in the form of donations of Federal surplus properties and the sale at $2.50 per acre of public domain lands. In 1973, an estimated 20,000 acres of Federal surplus property valued at $120 million will be donated and 15,000 acres of public domain lands will be sold at $2.50 per acre for these purposes.

Table S-5.

Recreation, Parks, Historic Sites, Fisheries, and Wildlife Activities

[In millions of dollars]

Agency	Budget authority			Outlays		
	1971 actual	1972 estimate	1973 estimate	1971 actual	1972 estimate	1973 estimate
Interior	642	787	673	485	651	626
Agriculture	96	108	105	92	105	107
Housing and Urban Development	75	100	100	40	70	79
Defense—Civil	39	41	65	39	41	65
Labor	12	12	12	12	12	12
Tennessee Valley Authority	3	4	3	3	4	3
Other agencies	3	4	4	4	4	4
Total	**870**	**1,056**	**962**	**674**	**887**	**898**

understanding, describing, and predicting the environment [2, 3]

Federal agencies conduct a wide variety of activities to understand, describe, and predict environmental conditions. Objectives range from the provision of routine weather forecasts to the scientific understanding of complex ecological systems. Funding for these activities will increase in 1973.

[In millions of dollars]

	1970 actual	1971 actual	1972 estimate	1973 estimate
Budget authority	719	914	1,031	1,101
Obligations	710	914	1,050	1,117
Outlays	702	856	951	1,051

activities—Over half of the funding for this category supports environmental observation and measurement to describe and predict weather and ocean conditions and to develop methods of prediction and control of earthquakes.

Outlays will increase by 10 percent, from $484 million in 1972 to $531 million in 1973 for research, development, and operational ac-

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[2] This section excludes activities reported under pollution control and abatement.

[3] Funding data are not available for 1969 on a basis comparable to 1970–73.

tivities in this category. Funding will also be increased, but less sharply for:

- Survey activities to describe the phyical environment for the purpose of preparing maps and charts; and
- Weather modification.

Table S-6.

Understanding, Describing, and Predicting the Environment

[In millions of dollars]

Type of activity	Budget authority			Outlays		
	1971 actual	1972 estimate	1973 estimate	1971 actual	1972 estimate	1973 estimate
Observe and predict weather and ocean conditions, disturbances:						
Research and development	193	210	253	163	194	223
Operations	284	297	313	287	290	308
Locating and describing natural resources:						
Research and development	172	172	149	156	152	148
Operations	70	79	81	66	77	81
Physical environmental surveys:						
Research and development	6	8	14	6	8	14
Operations	81	99	102	76	87	102
Weather modification	17	19	24	17	18	22
Research on environmental impact on man	33	42	51	29	38	47
Ecological and other basic environmental research	58	105	114	56	87	106
Total :	**914**	**1,031**	**1,101**	**856**	**951**	**1,051**

Additional emphasis will be placed upon research to develop a better understanding of the impact of the environment on man, for which outlays will be increased by 21 percent, from $38 million in 1972 to $47 million in 1973; and on ecological and other basic environmental research, for which outlays will be increased by 22 percent, from $87 million in 1972 to $106 million in 1973.

agencies involved—In this overall category, the Department of Commerce accounts for about 27 percent of all Federal activities NOAA carries on a wide range of environmental observation and prediction activities, weather modification experiments, mapping and charting, development of instrumentation, data dissemination services, and related research. Outlays will increase from $264 million in 1972 to $309 million in 1973 for improved weather services; hurricane and severe storm warnings; weather modification research; earthquake and seismic research; environmental satellite system procurement; monitoring, prediction, and assessment of marine resources; and in the sea grant program with universities and with industries.

The Department of Defense conducts activities in environmental observation and measurement to describe and predict weather and ocean conditions and disturbances important to military operations. Research is conducted in oceanographic instrumentation development and operational systems for observing and forecasting the ocean environment. Research and development is also conducted in weather modification by nuclear and nucleation process, cloud physics, numerical modeling of warm fog and cumulous cloud situations, and fog dispersal field experiments.

The National Science Foundation supports research activities related to improving the quality of the environment, such as the regional environmental systems and weather modification, programs of research applied to national needs (RANN), the international decade of ocean exploration (IDOE), and other environmentally related research programs. Outlays will increase by 17 percent from $136 million in 1972 to $159 million in 1973. Increases are due to intensified large-scale RANN support of activities including: finding ways to modify weather for man's benefit, measuring trace contaminants in the environment, and identifying and analyzing the problems of regional environmental systems such as the Chesapeake Bay, Delaware Basin, and the Gallatin Canyon in the Rockies. In 1973 the IDOE program will support large field programs to make shipboard measurements and to collect water samples in the major oceans. Also IDOE will support comprehensive studies of the living resources of the ocean including the biological aspects of coastal upwelling.

The Department of the Interior carries out such activities as geologic investigations, topographic mapping, weather modification, and water resources research. Increases in 1973 will provide principally for further research on the prediction and control of earthquakes, increased mapping of the Outer Continental Shelf, and expansion of Interior's work on application of remote sensing data from aircraft and spacecraft to earth resource measurement and analysis.

The National Aeronautics and Space Administration conducts activities concerned with the application of satellite technology to atmospheric sciences and measurement of earth resources. Currently under study is an assessment of the capabilities of remote sensing systems to gather data on air, land, and water pollution with the objective of demonstrating the feasibilty of remote sensing systems to detect, identify, measure, and monitor the environmental effects of various pollutants.

The Department of Agriculture conducts research on such activities as remote sensing from aircraft of soil properties and uses, water salinity, and plant stress effects. A variety of activities are conducted to develop better materials and methods necessary to the establishment of replacement vegetation and proper land management. Several types of environmental analysis and monitoring systems have been established in national forest and in State and private forest programs. Extensive climatological monitoring and forecasting is carried out in connection with fire control programs. Emphasis will continue on basic ecological research.

Table S-7.

Understanding, Describing, and Predicting the Environment, by Agency

[In millions of dollars]

Agency	Budget authority			Outlays		
	1971 actual	1972 estimate	1973 estimate	1971 actual	1972 estimate	1973 estimate
Commerce [1]	248	280	332	237	264	309
Defense—Military	176	174	165	161	164	167
National Science Foundation	94	166	169	83	136	159
Interior	116	131	153	115	128	148
National Aeronautics and Space Administration	171	158	145	157	141	135
Agriculture	56	57	56	57	57	57
Health, Education, and Welfare	20	26	28	19	22	27
Transportation	14	19	21	10	19	21
Smithsonian Institution	11	14	20	11	13	18
Other agencies	8	6	12	6	7	10
Total	**914**	**1,031**	**1,101**	**856**	**951**	**1,051**

[1] Funding shown above for Commerce has been adjusted to include activities actually carried out by the Departments of Defense, Interior, and Transportation and National Science Foundation prior to Oct. 3, 1970. The budget authority adjustment is $9 million in 1971, and the related outlay adjustment is $14 million and $7 million in 1972.

The Department of Health, Education, and Welfare conducts a variety of activities relating to environmental impact of man, principally research at the Department's National Institute of Environmental Health Sciences.

The Department of Transportation conducts oceanographic and meterological research and surveys largely through the Coast Guard.

The Smithsonian Institution conducts a variety of programs dealing with environmental impact on man and is developing environmental baseline data on the abundance of plants and animals in relation to modification of the environment by man. Biological and physical data are being assembled and analyzed on specific important ecosystems to predict the consequences of environmental change.

sewer and water programs

Assistance for the construction of sewer and water systems is provided through Federal grants, direct loans, and insured loans. The primary objective of Federal sewer and water programs is not pollution control, but rather urban or rural development. To the extent assisted sewer projects provide environmental benefits, they do so as a result of their association with waste treatment and other abatement programs.

[In millions of dollars]

	1969 estimate	1970 actual	1971 actual	1972 estimate	1973 estimate
Budget authority	295	252	573	765	150
Obligations	420	409	546	622	610
Outlays	300	364	331	465	550

Grants to finance water system and sewerline construction are made by five Federal agencies. The Department of Housing and Urban Development provides assistance for basic sewer and water facilities as part of its community development efforts. Approximately 400 grant reservations will be made in both 1972 and 1973. In addition, some public facility loans will be made to finance sewer and water facilities construction in each of these years. Outlays will increase in 1973 by 15 percent, from $155 to $177 million. Grant reservations under HUD's water and sewer program will continue at the $200 million level in 1973. Unused balances are sufficient to fund the program in 1973, so no additional appropriation is necessary. Increases in this program have been limited, as Federal funds have been considered more important to expand the waste treatment construction program.

The Department of Agriculture provides grants and loans for basic water and waste facilities in rural communities with population not in excess of 5,500 people. The total program level—grants and loans—

increased from $306 million in 1971 to $342 million in 1972 and benefiting from the program increases from 266,000 in 1970 to 1973. Loans total $300 million in 1973. The number of rural families 500,000 in 1973. Outlays (after deducting the repayment of prior year loans) will increase by 24 percent in 1973, from $231 to $287 million.

The Department of Commerce provides assistance to municipalities as a part of its economic development efforts. Outlays will increase by 9 percent from $66 million in 1972 to $72 million in 1973. Other agencies providing sewer and water system grants are the Appalachian Regional Commission and the Department of the Interior (for the trust territory).

Grants and loans made by the Environmental Protection Agency, Agriculture, Commerce, and Housing and Urban Development for waste treatment plants and interceptor sewers are included in the section on pollution control and abatement.

Table S-8.

Sewer and Water Programs

[In millions of dollars] [1]

Category	Budget authority			Outlays		
	1971 actual	1972 estimate	1973 estimate	1971 actual	1972 estimate	1973 estimate
Purpose:						
Sewer grants	243	312	39	88	113	118
Sewer loans	19	34	30	31	55	113
Water system grants	292	375	47	116	140	143
Water system loans	19	45	34	97	158	177
Total	**573**	**765**	**150**	**331**	**466**	**550**
Agencies:						
Housing and Urban Development	125	500	....	148	155	177
Agriculture	140	165	55	117	231	287
Commerce (economic development)	80	83	84	54	66	72
Other agencies	18	17	12	11	15	14
Total	**573**	**765**	**150**	**331**	**466**	**550**

[1] Funds provided by the above agencies which are for construction of waste treatment facilities or interceptor sewers, often counted as part of "sewer and water programs," are included in the section on pollution control and abatement for purposes of this analysis. Funds shown in above table are for water supply systems and collecting sewers. They are *not* included in tables S-1, 2, or 3.

environmental research and development activities

Sections of this analysis include funding for environmental research and development activities for convenience of reference. Funding for R. & D. included in the three sections is summarized in table S–9.

Table S-9

Environmental Research and Development Activities

[In millions of dollars]

Category	Budget authority			Outlays		
	1971 actual	1972 estimate	1973 estimate	1971 actual	1972 estimate	1973 estimate
Pollution control and abatement	422	516	599	366	474	561
Selected environmental protection and enhancement activities	20	21	22	19	32	22
Understanding, describing, and predicting	479	556	605	427	497	559
Total	**921**	**1,093**	**1,226**	**812**	**1,003**	**1,142**

other environmental activities

The meaning of the term "environment" is still subject to widely varying definitions. This special analysis of Federal funding for environmental activities has been limited to selected areas. Among the areas of federally funded activity important to environmental understanding and environmental quality not included in this analysis are:

- Environment education;
- Preventing or correcting environmental degradation resulting from public works or natural resource exploitation;
- Management of public lands;
- Population control and population distribution;
- Federal activities conducted outside the United States (except that scientific activities financed under the special foreign currency program are included);
- Activities to reduce or avoid the use of pesticides;
- Increased cost of new facilities and low polluting fuels (e.g., low sulfur coal) to meet pollution control standards; and
- Highway beautification program.

appendix h

statements on proposed federal actions affecting the environment: guidelines*

1. *Purpose.*—This memorandum provides guidelines to Federal departments, agencies, and establishments for preparing detailed environmental statements on the proposals for legislation and other major Federal actions significantly affecting the quality of the human environment as required by section 102(2)(C) of the National Environmental Policy Act (Public Law 91–190) (hereafter "the Act"). Underlying the preparation of such environmental statements is the mandate of both the Act and Executive Order 11514 (35 F.R. 4247) of March 4, 1970, that all Federal agencies, to the fullest extent possible, direct their policies, plans and programs so as to meet national environmental goals. The objective of section 102(2)(C) of the Act and of these guidelines is to build into the agency decision making process an appropriate and careful consideration of the environmental aspects of proposed action and to assist agencies in implementing not only the letter, but the spirit, of the Act. This memorandum also provides guidance on implementation of section 309 of the Clean Air Act, as amended (42 U.S.C. 1857 *et seq.*).

2. *Policy.*—As early as possible and in all cases prior to agency decision concerning major action or recommendation or a favorable report on legislation that significantly affects the environment, Federal agencies will, in consultation with other appropriate Federal, State, and local agencies, assess in detail the potential environmental impact in order that adverse effects are avoided, and environmental quality is restored or enhanced, to the fullest extent practicable. In particular, alternative actions that will minimize adverse impact should be explored and both the long- and short-range implications to man, his physical and social surroundings, and to na-

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*36 Fed. Register, 7724–7729, Apr. 23, 1971.

ture, should be evaluated in order to avoid to the fullest extent practicable undesirable consequences for the environment.

3. *Agency and OMB procedures.*—(a) Pursuant to section 2(f) of Executive Order 11514, the heads of Federal agencies have been directed to proceed with measures required by section 102(2)(C) of the Act. Consequently, each agency will establish, in consultation with the Council on Environmental Quality, not later than June 1, 1970 (and, by July 1, 1971, with respect to requirements imposed by revisions in these guidelines, which will apply to draft environmental statements circulated after June 30, 1971), its own formal procedures for: (1) Identifying those agency actions requiring environmental statements, the appropriate time prior to decision for the consultations required by section 102(2)(C), and the agency review process for which environmental statements are to be available, (2) obtaining information required in their preparation, (3) designating the officials who are to be responsible for the statements, (4) consulting with and taking account of the comments of appropriate Federal, State, and local agencies, including obtaining the comment of the Administrator of the Environmental Protection Agency, whether or not an environmental statement is prepared, when required under section 309 of the Clean Air Act, as amended, and section 8 of these guidelines, and (5) meeting the requirements of section 2(b) of Executive Order 11514 for providing timely public information on Federal plans and programs with environmental impact including procedures responsive to section 10 of these guidelines. These procedures should be consonant with the guidelines contained herein. Each agency should file seven (7) copies of all such procedures with the Council on Environmental Quality, which will provide advice to agencies in the preparation of their procedures and guidance on the application and interpretation of the Council's guidelines. The Environmental Protection Agency will assist in resolving any question relating to section 309 of the Clean Air Act, as amended.

(b) Each Federal agency should consult, with the assistance of the Council on Environmental Quality and the Office of Management and Budget if desired, with other appropriate Federal agencies in the development of the above procedures so as to achieve consistency in dealing with similar activities and to assure effective coordination among agencies in their review of proposed activities.

(c) State and local review of agency procedures, regulations, and policies for the administration of Federal programs of assistance to State and local governments will be conducted pursuant to procedures established by the Office of Management and Budget Circular No. A–85. For agency procedures subject to OMB Circular No. A–85 a 30-day extension in the July 1, 1971, deadline set in section 3(a) is granted.

(d) It is imperative that existing mechanisms for obtaining the views of Federal, State, and local agencies on proposed Federal actions be utilized to the extent practicable in dealing with environmental matters. The Office of Management and Budget will issue instructions, as necessary, to take full advantage of existing mechanisms (relating to procedures for handling legislation, preparation of budgetary materials, new procedures, water resource and other projects, etc.).

4. *Federal agencies included.*—Section 102(2)(C) applies to all agencies of the Federal Government with respect to recommendations or favorable reports on proposals for (i) legislation and (ii) other major Federal actions significantly affecting the quality of the human environment. The phrase "to the fullest extent possible" in section 102(2)(C) is meant to make clear that each agency of the Federal Government shall comply with the requirement unless existing law applicable to the agency's operations expressly prohibits or makes compliance impossible. (Section 105 of the Act provides that "The policies and goals set forth in this Act are supplementary to those set forth in existing authorizations of Federal agencies.")

5. *Actions included.*—The following criteria will be employed by agencies in deciding whether a proposed action requires the preparation of an environmental statement:

(a) "Actions" include but are not limited to:

(i) Recommendations or favorable reports relating to legislation including that for appropriations. The requirement for following the section 102(2)(C) procedure as elaborated in these guidelines applies to both (i) agency recommendations on their own proposals for legislation and (ii) agency reports on legislation initiated elsewhere. (In the latter case only the agency which has primary responsibility for the subject matter involved will prepare an environmental statement.) The Office of Management and Budget will supplement these general guidelines with specific instructions relating to the way in which the section 102(2)(C) procedure fits into its legislative clearance process;

(ii) Projects and continuing activities: directly undertaken by Federal agencies; supported in whole or in part through Federal contracts, grants, subsidiaries, loans, or other forms of funding assistance; involving a Federal lease, permit, license, certificate, or other entitlement for use;

(iii) Policy, regulations, and procedure-making.

(b) The statutory clause "major Federal actions significantly affecting the quality of the human environment" is to be construed by agencies with a view to the overall, cumulative impact of the action proposed (and of further actions contemplated). Such actions may be localized in their impact, but if there is potential that the environment may be significantly affected, the statement is to be prepared. Proposed actions, the environmental impact of which is likely to be highly controversial, should be covered in all cases. In considering what constitutes major action significantly affecting the environment, agencies should bear in mind that the effect of many Federal decisions about a project or complex of projects can be individually limited but cumulatively considerable. This can occur when one or more agencies over a period of years puts into a project individually minor but collectively major resources, when one decision involving a limited amount of money is a precedent for action in much larger cases or represents a decision in principle about a future major course of action, or when several government agencies individually make decisions about partial aspects of a major action. The lead agency should prepare an environmental statement if it is reasonable to anticipate a cumulatively significant impact on the environment from Federal action. "Lead agency" refers to the Federal agency which has primary authority for committing the Federal Government to a course of action with significant environmental impact. As necessary, the Council on Environmental Quality will assist in resolving questions of lead agency determination.

(c) Section 101(b) of the Act indicates the broad range of aspects of the environment to be surveyed in any assessment of significant effect. The Act also indicates that adverse significant effects include those that degrade the quality of the environment, curtail the range of beneficial uses of the environment, and serve short-term, to the disadvantage of long-term, environmental goals. Significant effects can also include actions which may have both beneficial and detrimental effects, even if, on balance, the agency believes that the effect will be beneficial. Significant adverse effects on the quality of the human environment include both those that directly affect human beings and those that indirectly affect human beings through adverse effects on the environment.

(d) Because of the Act's legislative history, environmental protective regulatory activities concurred in or taken by the Environmental Protection Agency are not deemed actions which require the preparation of environmental statements under section 102(2)(C) of the Act.

6. *Content of environmental statement.*—(a) The following points are to be covered:

(i) A description of the proposed action including information and technical data adequate to permit a careful assessment of environmental impact by commenting agencies. Where relevant, maps should be provided.

(ii) The probable impact of the proposed action on the environment, including impact on ecological systems such as wildlife, fish, and marine life. Both primary and secondary significant consequences for the environmenta should be included in the analysis. For example, the implications, if any, of the action for population distribution or concentration should be estimated and an assessment made of the effect of any possible change in population patterns upon the resource base, including land use, water, and public services, of the area in question.

(iii) Any probable adverse environmental effects which cannot be avoided (such as water or air pollution, undesirable land use patterns, damage to life systems, urban congestion, threats to health or other consequences adverse to the environmental goals set out in section 101(b) of the Act).

(iv) Alternatives to the proposed action (section 102(2)(D) of the Act requires the responsible agency to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources"). A rigorous exploration and objective evaluation of alternative actions that might avoid some or all of the adverse environmental effects is essential. Sufficient analysis of such alternatives and their costs and impact on the environment should accompany the proposed action through the agency review process in order not to foreclose prematurely options which might have less detrimental effects.

(v) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity. This in essence requires the agency to assess the action for cumulative and long-term effects from the perspective that each generation is trustee of the environment for succeeding generations.

(vi) Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. This requires the agency to identify the extent to which the action curtails the range of beneficial uses of the environment.

(vii) Where appropriate, a discussion of problems and objections raised by other Federal, State, and local agencies and by private organizations and individuals in the review process and the disposition of the issues involved. (The section may be added at the end of the review process in the final text of the environmental statement.)

(b) With respect to water quality aspects of the proposed action which have been previously certified by the appropriate State or interstate organization as being in substantial compliance with applicable water quality standards, the comment of the Environmental Protection Agency should also be requested.

(c) Each environmental statement should be prepared in accordance with the precept in section 102(2)(A) of the Act that all agencies of the Federal Government utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and decisionmaking which may have an impact on man's environment.

(d) Where an agency follows a practice of declining to favor an alternative until public hearings have been held on a proposed action, a draft environmental statement may be prepared and circulated indicating that two or more alternatives are under consideration.

(e) Appendix 1 prescribes the form of the summary sheet which should accompany each draft and final environmental statement.

7. ***Federal agencies to be consulted in connection with preparation of environmental statement.***—A Federal agency considering an action requiring an environmental statement, on the basis of: (i) A draft environmental statement for which it takes responsibility, or (ii) comparable information followed by a hearing subject to the provisions of the Administrative Procedure Act, should consult with, and obtain the comment on the environmental impact of the action of, Federal agencies with jurisdiction by law or special expertise with respect to any environmental impact involved. These Federal agencies include components of (depending on the aspect or aspects of the environment):

Advisory Council on Historic Preservation.
Department of Agriculture.
Department of Commerce.
Department of Defense.
Department of Health, Education, and Welfare.
Department of Housing and Urban Development.
Department of the Interior.
Department of State.
Department of Transportation.
Atomic Energy Commission.
Federal Power Commission.
Environmental Protection Agency.
Office of Economic Opportunity.

For actions specifically affecting the environment of their geographic jurisdictions, the following Federal and Federal-State agencies are also to be consulted:

Tennessee Valley Authority.
Appalachian Regional Commission.
National Capital Planning Commission.
Delaware River Basin Commission.
Susquehanna River Basin Commission.

Agencies seeking comment should determine which one or more of the above listed agencies are appropriate to consult on the basis of the areas of expertise identified in appendix 2 to these guidelines. It is recommended: (i) That the above listed departments and agencies establish contact points, which often are most appropriately regional offices, for providing comments on the environmental statements, and (ii) that departments from which comment is solicited coordinate and consolidate the comments of their component entities. The requirement in section 102(2)(C) to obtain comment from Federal agencies having jurisdiction or special expertise is in addition to any specific statutory obligation of any Federal agency to coordinate or consult with any other Federal or State agency. Agencies seeking comment may establish time limits of not less than thirty (30) days for reply, after which it may be presumed, unless the agency consulted requests a specified extension of time, that the agency consulted has no comment to make. Agencies seeking comment should endeavor to comply with requests for extensions of time of up to fifteen (15) days.

8. *Interim EPA procedures for implementation of section 309 of the Clean Air Act, as amended.*—(a) Section 309 of the Clean Air Act, as amended, provides:

> SEC. 309. (a) The Administrator shall review and comment in writing on the environmental impact of any matter relating to duties and responsibilities granted pursuant to this Act or other provisions of the authority of the Administrator, contained in any (1) legislation proposed by any Federal department or agency, (2) newly authorized Federal projects for construction and any major Federal agency action (other than a project for construction) to which section 102(2)(C) of Public Law 91–190 applies, and (3) proposed regulations published by any department or agency of the Federal Government. Such written comment shall be made public at the conclusion of any such review.
>
> (b) In the event the Administrator determines that any such legislation, action, or regulation is unsatisfactory from the standpoint of public health or welfare or environmental quality, he shall publish his determination and the matter shall be referred to the Council on Environmental Quality.

(b) Accordingly, wherever an agency action related to air or water quality, noise abatement and control, pesticide regulation, solid waste disposal, radiation criteria and standards, or other provisions of the authority of the Administrator if the Environmental Protection Agency is involved, including his enforcement authority, Federal agencies are required to submit for review and comment by the Administrator in writing: (i) Proposals for new Federal construction projects and other major Federal agency actions to which section 102(2)(C) of the National Environmental Policy Act applies, and (ii) proposed legislation and regulations, whether or not section 102(2)(C) of the National Environmental Policy Act applies. (Actions requiring review by the Administrator do not include litigation or enforcement proceedings.) The Administrator's comments shall constitute his comments for the purposes of both section 309 of the Clean Air Act and section 102(2)(C) of the National Environmental Policy Act. A period of 45 days shall be allowed for such review. The Administrator's written comment shall be furnished to the responsible Federal department or agency, to the Council on Environmental Quality and summarized in a notice published in the Federal Register. The public may obtain copies of such comment on request from the Environmental Protection Agency.

9. *State and local review.*—Where no public hearing has been held on the proposed action at which the appropriate State and local review has been invited, and where review of the environmental impact of the proposed action by State and local agencies authorized to develop and enforce environmental standards is relevant, such State and local review shall be provided as follows:

(a) For direct Federal development projects and projects assisted under programs listed in attachment D of the Office of Management and Budget Circular No. A–95, review of draft environmental statements by State and local governments will be through procedures set forth under part 1 of Circular No. A–95.

(b) Where these procedures are not appropriate and where a proposed action affects matters within their jurisdiction, review of the draft environmental statement on a proposed action by State and local agencies authorized to develop and enforce environmental standards and their comments on the environmental impact of the proposed action may be obtained directly or by distributing the draft environmental statement to the appropriate State, regional, and metropolitan clearinghouses unless the Governor of the State involved has designated some other point for obtaining this review.

10. *Use of statements in agency review processes; distribution to Council on Environmental Quality; availability to public.*—(a) Agencies will need to identify at what stage or stages of a series of actions relating to a particular matter the environmental statement procedures of this directive will be applied. It will often be necessary to use the procedures both in the development of a national program and in the review of proposed projects within the national program. However, where a grant-in-aid program does not entail prior approval by Federal agencies of specific projects the view of Federal, State, and local agencies in the legislative process may have to suffice. The principle to be applied is to obtain views of other agencies at the earliest feasible time in the development of program and project proposals. Care should be exercised so as not to duplicate the clearance process, but when actions being considered differ significantly from those that have already been reviewed pursuant to section 102(2)(C) of the Act an environmental statement should be provided.

(b) Ten (10) copies of draft environmental statements (when prepared), ten (10) copies of all comments made thereon (to be forwarded to the Council by the entity making comment at the time comment is forwarded to the responsible agency), and ten (10) copies of the final text of environmental statements (together with all comments received thereon by the responsible agency from Federal, State, and local agencies and from private organizations and individuals) shall be supplied to the Council on Environmental Quality in the Executive Office of the President (this will serve as making environmental statements available to the President). It is important that draft environmental statements be prepared and circulated for comment and furnished to the Council early enough in the agency review process before an action is taken in order to permit meaningful consideration of the environmental issues involved. To the maximum extent practicable no administrative action (i.e., any proposed action to be taken by the agency other than agency proposals for legislation to Congress or agency reports on legislation) subject to section 102(2)(C) is to be taken sooner than ninety (90) days after a draft environmental statement has been circulated for comment, furnished to the Council and, except where advance public disclosure will result in significantly increased costs of procurement to the Government, made available to the public pursuant to these guidelines; neither should such administrative action be taken sooner than thirty (30) days after the final text of an environmental statement (together with comments) has been made available to the Council and the public. If the final text of an environmental statement is filed within ninety (90) days after a draft statement has been circulated for comment, furnished to the Council and made public pursuant to this section of these guidelines, the thirty (30) day period and ninety (90) day period may run concurrently to the extent that they overlap.

(c) With respect to recommendations or reports on proposals for legislation to which section 102(2)(C) applies, the final text of the environmental statement and comments thereon should be available to the Congress and to the public in support of the proposed legislation or report. In cases where the scheduling of congressional hearings on recommendations or reports on proposals for legislation which the Federal agency has forwarded to the Congress does not allow adequate time for the completion of a final text of an environmental statement (together with comments), a draft environmental statement may be furnished to the Congress and made available to the public pending transmittal of the comments as received and the final text.

(d) Where emergency circumstances make it necessary to take an action with significant environmental impact without observing the provisions of these guidelines concerning minimum periods for agency review and advance availability of environmental statements, the Federal agency proposing to take the action should consult with the Council on Environmental Quality about alternative arrangements. Similarly, where there are overriding considerations of expense to the Government or impaired program effectiveness, the responsible agency should consult the Council concerning appropriate modifications of the minimum periods.

(e) In accord with the policy of the National Environmental Policy Act and Executive Order 11514 agencies have a responsibility to develop procedures to insure the fullest practicable provision of timely public information and understanding of Federal plans and programs with environmental impact in order to obtain the views of interested parties. These procedures shall include, whenever appropriate, provision for public hearings, and shall provide the public with relevant information, including information on alternative courses of action. Agencies which hold hearings on proposed administrative actions or legislation should make the draft environmental statement available to the public at least 15 days prior to the time of the relevant hearings except where the agency prepares the draft statement on the basis of a hearing subject to the Administrative Procedure Act and preceded by adequate public notice and information to identify the issues and obtain the comments provided for in sections 6 to 9 of these guidelines.

(f) The agency which prepared the environmental statement is responsible for making the statement and the comments received available to the public pursuant to the provisions of the Freedom of Information Act (5 U.S.C., sec. 552), without regard to the exclusion of interagency memoranda when such memoranda transmit comments of Federal agencies listed in section 7 of these guidelines upon the environmental impact of proposed actions subject to section 102 (2) (C).

(g) Agency procedures prepared pursuant to section 3 of these guidelines shall implement these public information requirements and shall include arrangements for availability of environmental statements and comments at the head and appropriate regional offices of the responsible agency and at appropriate State, regional, and metropolitan clearinghouses unless the Governor of the State involved designates some other point for receipt of this information.

11. *Application of section 102(2)(C) procedure to existing projects and programs.*—To the maximum extent practicable the section 102(2)(C) procedure should be applied to further major Federal actions having a significant effect on the environment even though they arise from projects or programs initiated prior to enactment of the Act on January 1, 1970. Where it is not practicable to reassess the basic course of action, it is still important that further incremental major actions be shaped so as to minimize adverse environmental consequences. It is also important in further action that account be taken of environmental consequences not fully evaluated at the outset of the project or program.

12. *Supplementary guidelines, evaluation of procedures.*—(a) The Council on Environmental Quality after examining environmental statements and agency procedures with respect to such statements will issue such supplements to these guidelines as are necessary.

(b) Agencies will continue to assess their experience in the implementation of the section 102(2)(C) provisions of the Act and in conforming with these guidelines and report thereon to the Council on Environmental Quality by December 1, 1971. Such reports should include an identification of the problem areas and suggestions for revision or clarification of these guidelines to achieve effective coordination of views on environmental aspects (and alternatives, where appropriate) of proposed actions without imposing unproductive administrative procedures.

RUSSELL E. TRAIN,
Chairman.

appendix i

A summary sheet should accompany each environmental statement submitted, consisting of no more than one page, and covering the following items:

(Check one) ( ) Draft. ( ) Final Environmental Statement.

Name of Responsible Federal Agency (with name of operating division where appropriate).

1. Name of Action. (Check one) ( ) Administrative Action. ( ) Legislative Active.

2. Brief description of action indicating what States (and counties) particularly affected.

3. Summary of environmental impact and adverse environmental effects.

4. List alternatives considered.

5. a. (For draft statements) List all Federal, State, and local agencies from which comments have been requested.

b. (For final statements) List all Federal, State, and local agencies and other sources from which written comments have been received.

6. Dates draft statement and final statement made available to Council on Environmental Quality and public.

appendix ii—federal agencies with jurisdiction by law or special expertise to comment on various types of environmental impacts

air

air quality and air pollution control

Department of Agriculture: Forest Service (effects on vegetation).
Department of Health, Education, and Welfare (health aspects).
Environmental Protection Agency: Air Pollution Control Office.
Department of the Interior:
  Bureau of Mines (fossil and gaseous fuel combustion).
  Bureau of Sport Fisheries and Wildlife (wildlife).
Department of Transportation:
  Assistant Secretary for Systems Development and Technology (auto emission).
  Coast Guard (vessel emissions).
  Federal Aviation Administration (aircraft emissions).

weather modification

Department of Commerce: National Oceanic and Atmospheric Administration.
Department of Defense: Department of the Air Force.
Department of the Interior: Bureau of Reclamation.

energy

environmental aspects of electric energy generation and transmission

Atomic Energy Commission (nuclear power).
Environmental Protection Agency:

Water Quality Office.
Air Pollution Control Office.
Department of Agriculture: Rural Electrification Administration (rural areas).
Department of Defense: Army Corps of Engineers (hydro-facilities).
Federal Power Commission (hydro-facilities and transmission lines).
Department of Housing and Urban Development (urban areas).
Department of the Interior—(facilities on Government lands).

natural gas energy development, transmission, and generation

Federal Power Commission (natural gas production, transmission, and supply).
Department of the Interior:
  Geological Survey.
  Bureau of Mines.

hazardous substances

toxic materials

Department of Commerce: National Oceanic and Atmospheric Administration.
Department of Health, Education, and Welfare (health aspects).
Environmental Protection Agency.
Department of Agriculture:
  Agricultural Research Service.
  Consumer and Marketing Service.
Department of Defense.
Department of the Interior: Bureau of Sport Fisheries and Wildlife.

pesticides

Department of Agriculture:
  Agricultural Research Service (biological controls, food and fiber production).
  Consumer and Marketing Service.
  Forest Service.
Department of Commerce:
  National Marine Fisheries Service.
  National Oceanic and Atmospheric Administration.
Environmental Protection Agency: Office of Pesticides
Department of the Interior:
  Bureau of Sport Fisheries and Wildlife (effects on fish and wildlife).
  Bureau of Land Management.
Department of Health, Education, and Welfare (health aspects).

herbicides

Department of Agriculture:
  Agricultural Research Service.
  Forest Service.
Environmental Protection Agency: Office of Pesticides.
Department of Health, Education, and Welfare (health aspects).
Department of the Interior:
  Bureau of Sport Fisheries and Wildlife.
  Bureau of Land Management.
  Bureau of Reclamation.

transportation and handling of hazardous materials

Department of Commerce:
  Maritime Administration.
  National Marine Fisheries Service.
  National Oceanic and Atmospheric Administration (impact on marine life).

- Department of Defense:
  - Armed Services Explosive Safety Board.
  - Army Corps of Engineers (navigable waterways).
- Department of Health, Education, and Welfare: Office of the Surgeon General (health aspects).
- Department of Transportation:
  - Federal Highway Administration Bureau of Motor Carrier Safety.
  - Coast Guard.
  - Federation Railroad Administration.
  - Federal Aviation Administration.
  - Assistant Secretary for Systems Development and Technology.
  - Office of Hazardous Materials.
  - Office of Pipeline Safety.
- Environmental Protection Agency (hazardous substances).
- Atomic Energy Commission (radioactive substances).

land use and management

coastal areas: wetlands, estuaries, waterfowl refuges, and beaches

- Department of Agriculture: Forest Service.
- Department of Commerce:
  - National Marine Fisheries Service (impact on marine life).
  - National Oceanic and Atmospheric Administration (impact on marine life).
- Department of Transportation: Coast Guard (bridges, navigation).
- Department of Defense: Army Corps of Engineers (beaches, dredge, and fill permits, Refuse Act permits).
- Department of the Interior:
  - Bureau of Sport Fisheries and Wildlife.
  - National Park Service.
  - U.S. Geological Survey (coastal geology).
  - Bureau of Outdoor Recreation (beaches).
- Department of Agriculture: Soil Conservation Service (soil stability, hydrology).
- Environmental Protection Agency: Water Quality Office.

historic and archeological sites

- Department of the Interior: National Park Service.
- Advisory Council on Historic Preservation.
- Department of Housing and Urban Development (urban areas).

flood plains and watersheds

- Department of Agriculture:
  - Agricultural Stabilization and Research Service.
  - Soil Conservation Service.
  - Forest Service.
- Department of the Interior.
  - Bureau of Outdoor Recreation.
  - Bureau of Reclamation.
  - Bureau of Sport Fisheries and Wildlife.
  - Bureau of Land Measurement.
  - U.S. Geological Survey.
- Department of Housing and Urban Development (urban areas).
- Department of Defense: Army Corps of Engineers.

mineral land reclamation

- Appalachian Regional Commission.
- Department of Agriculture: Forest Service.
- Department of the Interior:
  - Bureau of Mines.
  - Bureau of Outdoor Recreation.

Bureau of Sport Fisheries and Wildlife.
Bureau of Land Management.
U.S. Geological Survey.
Tennessee Valley Authority.

parks, forests, and outdoor recreation

Department of Agriculture:
  Forest Service.
  Soil Conservation Service.
Department of the Interior:
  Bureau of Land Management.
  National Park Service.
  Bureau of Outdoor Recreation.
  Bureau of Sport Fisheries and Wildlife.
Department of Defense: Army Corps of Engineers.
Department of Housing and Urban Development (urban areas).

soil and plant life, sedimentation, erosion, and hydrologic conditions

Department of Agriculture:
  Soil Conservation Service.
  Agricultural Research Service.
  Forest Service.
Department of Defense: Army Corps of Engineers (dredging, aquatic plants).
Department of Commerce: National Oceanic and Atmospheric Administration.
Department of the Interior:
  Bureau of Land Management.
  Bureau of Sport Fisheries and Wildlife.
  Geological Survey.
  Bureau of Reclamation.

noise

noise control and abatement

Department of Health, Education, and Welfare (health aspects).
Department of Commerce: National Bureau of Standards.
Department of Transportation:
  Assistant Secretary for Systems Development and Technology.
  Federal Aviation Administration (Office of Noise Abatement).
Environmental Protection Agency (Office of Noise).
Department of Housing and Urban Development (urban land use aspects, building materials standards).

physiological health and human well being
chemical contamination of food products

Department of Agriculture: Consumer and Marketing Service.
Department of Health, Education, and Welfare (health aspects).
Environmental Protection Agency: Office of Pesticides (economic poisons).

food additives and food sanitation

Department of Health, Education, and Welfare (health aspects).
Environmental Protection Agency: Office of Pesticides (economic poisons, e.g., pesticide residues).
Department of Agriculture: Consumer Marketing Service (meat and poultry products).

microbiological contamination

Department of Health, Education, and Welfare (health aspects).

radiation and radiological health

Department of Commerce: National Bureau of Standards.

Atomic Energy Commission.
Environmental Protection Agency: Office of Radiation.
Department of the Interior: Bureau of Mines (uranium mines).

sanitation and waste systems

Department of Health, Education, and Welfare (health aspects).
Department of Defense: Army Corps of Engineers.
Environmental Protection Agency:
  Solid Waste Office.
  Water Quality Office.
Department of Transportation: U.S. Coast Guard (ship sanitation).
Department of the Interior:
  Bureau of Mines (mineral waste and recycling, mine acid wastes, urban solid wastes).
  Bureau of Land Management (solid wastes on public lands).
  Office of Saline Water (demineralization of liquid wastes).

shellfish sanitation

Department of Commerce:
  National Marine Fisheries Service.
  National Oceanic and Atmospheric Administration.
Department of Health, Education, and Welfare (health aspects).
Environmental Protection Agency: Office of Water Quality.

transportation

air quality

Environmental Protection Agency: Air Pollution Control Office.
Department of Transportation: Federal Aviation Administration.
Department of the Interior:
  Bureau of Outdoor Recreation.
  Bureau of Sport Fisheries and Wildlife.
Department of Commerce: National Oceanic and Atmospheric Administration (meteorological conditions).

water quality

Environmental Protection Agency: Office of Water Quality.
Department of the Interior: Bureau of Sport Fisheries and Wildlife.
Department of Commerce: National Oceanic and Atmospheric Administration (impact on marine life and ocean monitoring).
Department of Defense: Army Corps of Engineers.
Department of Transportation: Coast Guard.

urban

congestion in urban areas, housing and building displacement

Department of Transportation: Federal Highway Administration.
Office of Economic Opportunity.
Department of Housing and Urban Development.
Department of the Interior: Bureau of Outdoor Recreation.

environmental effects with special impact in low-income neighborhoods

Department of the Interior: National Park Service.
Office of Economic Opportunity.
Department of Housing and Urban Development (urban areas).
Department of Commerce (economic development areas).
Economic Development Administration.
Department of Transportation: Urban Mass Transportation Administration.

rodent control

Department of Health, Education, and Welfare (health aspects).
Department of Housing and Urban Development (urban areas).

urban planning

Department of Transportation: Federal Highway Administration.
Department of Housing and Urban Development.
Environmental Protection Agency.
Department of the Interior:
  Geological Survey.
  Bureau of Outdoor Recreation.
Department of Commerce: Economic Development Administration.

water

water quality and water pollution control

Department of Agriculture:
  Soil Conservation Service.
  Forest Service.
Department of the Interior.
  Bureau of Reclamation.
  Bureau of Land Management.
  Bureau of Sport Fisheries and Wildlife.
  Bureau of Outdoor Recreation.
  Geological Survey.
  Office of Saline Water.
Environmental Protection Agency: Water Quality Office.
Department of Health, Education, and Welfare (health aspects).
Department of Defense:
  Army Corps of Engineers.
  Department of the Navy (ship pollution control).
Department of Transportation: Coast Guard (oil spills, ship sanitation).
Department of Commerce: National Oceanic and Atmospheric Administration.

marine pollution

Department of Commerce: National Oceanic and Atmospheric Administration.
Department of Transportation: Coast Guard.
Department of Defense:
  Army Corps of Engineers.
  Office of Oceanographer of the Navy.

river and canal regulation and stream channelization

Department of Agriculture: Soil Conservation Service.
Department of Defense: Army Corps of Engineers.
Department of the Interior:
  Bureau of Reclamation.
  Geological Survey.
  Bureau of Sport Fisheries and Wildlife.
Department of Transportation: Coast Guard.

wildlife

Environmental Protection Agency.
Department of Agriculture:
  Forest Service.
  Soil Conservation Service.
Department of the Interior:
  Bureau of Sport Fisheries and Wildlife.
  Bureau of Land Management.
  Bureau of Outdoor Recreation.

selected federal agency offices for receiving and coordinating comments upon environmental impact statements

advisory council on historic preservation

Robert Garvey, Executive Director, Suite 618, 801 19th Street NW., Washington, D.C. 20006, 343–8607.

department of agriculture

Dr. T.C. Byerly, Office of the Secretary, Washington, D.C., 20250, 388–7803.

appalachian regional commission

Orville H. Lerch, Alternate Federal Co-Chairman, 1666 Connecticut Avenue NW., Washington, D.C. 20235, 967–4103.

atomic energy commission

For nonregulatory matters: Joseph J. DiNunno, Director, Office of Environmental Affairs, Washington, D.C. 20545, 973–5391.

For regulatory matters: Lester R. Rogers, Director, Division of Radiation and Environmental Protection, Washington, D.C. 20545, 973–7376.

civil aeronautics board

Warren Sharfman, Legal Division, Washington, D.C. 20428, 382–4356.

department of the army (corps of engineers)

Col. William L. Barnes, Executive Director of Civil Works, Office of the Chief of Engineers, Washington, D.C. 20314, 693–7168.

department of commerce

Dr. Sydney R. Galler, Deputy Assistant Secretary for Environmental Affairs, Washington, D.C. 20230, 967–4335.

department of defense

John Busterud, Deputy Assistant Secretary, Environmental Quality, The Pentagon, Washington, D.C. 20301, 695–5030.

delaware river basin commission

W. Brinton Whitall, Secretary, Post Office Box 360, Trenton, N.J. 08603, 609–883–9500.

environmental protection agency

Sheldon Meyers, Director, Office of Federal Activities, Washington, D.C. 20460, 755–0920.

federal power commission

Frederick H. Warren, Commission's Advisor on Environmental Quality, 441 G Street NW., Washington, D.C. 20426, 386–6084.

general services administration

Rod Kreger, Deputy Administrator, General Services Administration, Washington, D.C. 20405, 343–6077.

Alternate contact: Aaron Woloshin, Director, Office of Environmental Affairs, General Services Administration—ADF, 343–4161.

department of health, education, and welfare

Dr. Merlin K. Duval, Assistant Secretary for Health and Science Affairs; HEW North Building, Washington, D.C. 20202, 963–4254.

department of housing and urban development [1]

Samuel C. Jackson, Assistant Secretary for Community Planning and Development; Washington, D.C. 20410, 755–6736.

department of the interior

Bruce Blanchard, Director, Environmental Project Review, Washington, D.C. 20240, 343–3891.

interstate commerce commission

Fritz Kahn, General Counsel, Washington, D.C. 20423, 343–4831.

national aeronautics and space administration

Ralph E. Cushman, Special Assistant, Office of Administrator, Washington, D.C. 20546, 755–8440.

national science foundation

Alfred Eggers, Assistant Director, Research Applied to National Needs, Washington, D.C. 20550, 632–7424.

tennessee valley authority

Dr. Francis Gartrell, Director of Environmental Research and Development, 720 Edney Building, Chattanooga, Tenn. 37401, 615–755–2002.

department of transportation

John C. Hirten, Acting Assistant Secretary for Environment and Urban Systems, Washington, D.C. 20590, 426–4563.

department of treasury

Richard E. Slitor, Assistant Director, Office of Tax Analysis, Washington, D.C. 20220, 964–2797.

department of state

Christian Herter, Jr., Special Assistant to the Secretary for Environmental Affairs, Washington, D.C. 20520, 632–7964.

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[1] Contact the Assistant Secretary with regard to environmental impacts of legislation, policy statements, program regulations and procedures, and precedent-making project decisions. For all other HUD consultation, contact the HUD Regional Administrator in whose jurisdiction the project lies, as follows:

James J. Barry, Regional Administrator I, Attention: Environmental Clearance Officer, Room 405, John F. Kennedy Federal Building, Boston, Mass. 02203, 617–223–4066.

S. William Green, Regional Administrator II, Attention: Environmental Clearance Officer, 26 Federal Plaza, New York, N.Y. 10007, 212–264–8068.

Warren P. Phelan, Regional Administrator III, Attention: Environmental Clearance Officer, Curtis Building, Sixth and Walnut Streets, Philadelphia, Pa. 19106, 215–597–2560.

Edward H. Baxter, Regional Administrator IV, Attention: Environmental Clearance Officer, Peachtree-Seventh Building, Atlanta, Ga. 30323, 404–526–5585.

George Vavoulis, Regional Administrator V, Attention: Environmental Clearance Officer, 360 North Michigan Avenue, Chicago, Ill. 60601, 312–353–5680.

Richard L. Morgan, Regional Administrator VI, Attention: Environmental Clearance Officer, Federal Office Building, 819 Taylor Street, Fort Worth, Tex. 76102, 817–334–2867.

Harry T. Morley, Jr., Regional Administrator VII, Attention: Environmental Clearance Officer, 911 Walnut Street, Kansas City, Mo. 64106, 816–374–[illegible]661.

Robert C. Rosenheim, Regional Administrator VIII, Attention: Environmental Clearance Officer, Samsonite Building, 1051 South Broadway, Denver, Colo. 80209, 303–837–4061.

Robert H. Baida, Regional Administrator IX, Attention: Environmental Clearance Officer, 450 Golden Gate Avenue, Post Office Box 36003, San Francisco, Calif. 94102, 415–556–4752.

Oscar P. Pederson, Regional Administrator X, Attention: Environmental Clearance Officer, Room 226, Arcade Plaza Building, Seattle, Wash. 98101, 206–583–5415.

appendix i

executive order 11643, environmental safeguards on activities for animal damage control on federal lands, february 8, 1972

By virtue of the authority vested in me as President of the United States and in furtherance of the purposes and policies of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) and the Endangered Species Conservation Act of 1969 (16 U.S.C. 668aa), it is ordered as follows:

section 1. policy—It is the policy of the Federal Government to (1) restrict the use on Federal lands of chemical toxicants for the purpose of killing predatory mammals or birds; (2) restrict the use on such lands of chemical toxicants which cause any secondary poisoning effects for the purpose of killing other mammals, birds, or reptiles; and (3) restrict the use of both such types of toxicants in any Federal programs of mammal or bird damage control that may be authorized by law. All such mammal or bird damage control programs shall be conducted in a manner which contributes to the maintenance of environmental quality, and to the conservation and protection, to the greatest degree possible, of the Nation's wildlife resources, including predatory animals.

section 2. definitions—As used in this order the term:

(a) "Federal lands" means all real property owned by or leased to the Federal Government, excluding (1) lands administered by the Secretary of the Interior pursuant to his trust responsibilities for Indian affairs, and (2) real property located in metropolitan areas.

(b) "Agencies" means the departments, agencies, and establishments of the executive branch of the Federal Government.

(c) "Chemical toxicant" means any chemical substance which, when ingested, inhaled, or absorbed, or when applied to or injected into the body, in relatively small amounts, by its chemical action may cause significant bodily malfunction, injury, illness, or death, to animals or man.

(d) "Predatory mammal or bird" means any mammal or bird which habitually preys upon other animals or birds.

(e) "Secondary poisoning effect" means the result attributable to a chemical toxicant which, after being ingested, inhaled, or absorbed, or when applied to or injected into, a mammal, bird, or reptile, is retained in its tissue or otherwise retained in such a manner and quantity that the tissue itself or retaining part if thereafter injested by man, mammal, bird, or reptile, produces the effects set forth in paragraph (c) of this section.

(f) "Field use" means on lands not in, or immediately adjacent to, occupied buildings.

section 3. restrictions on use of chemical toxicants—(a) Heads of agencies shall take such action as is necessary to prevent on any Federal lands under their jurisdiction, or in any Federal program of mammal or bird damage control under their jurisdiction:

(1) the field use of any chemical toxicant for the purpose of killing a predatory mammal or bird; or

(2) the field use of any chemical toxicant which causes any secondary poisoning effect for the purpose of killing mammals, birds, or reptiles.

(b) Notwithstanding the provisions of subsection (a) of this section, the head of any agency may authorize the emergency use on Federal lands under his jurisdiction of a chemical toxicant for the purpose of killing predatory mammals or, birds, or of a chemical toxicant which causes a secondary poisoning effect for the purpose of killing other mammals, birds, or reptiles, but only if in each specific case he makes a written finding, following consultation with the Secretaries of the Interior, Agriculture, and Health, Education, and Welfare, and the Administrator of the Environmental Protection Agency, that any emergency exists that cannot be dealt with by means which do not involve use of chemical toxicants, and that such use is essential:

(1) to the protection of the health or safety of human life;

(2) to the preservation of one or more wildlife species threatened with extinction, or likely within the foreseeable future to become so threatened; or

(3) to the prevention of substantial irretrievable damage to nationally significant natural resources.

section 4. rules for implementation of order—Heads of agencies shall issue such rules or regulations as may be necessary and appropriate to carry out the provisions and policy of this order.

RICHARD NIXON.

The White House
February 8, 1972

appendix j

executive order 11644, use of off-road vehicles on the public lands february 8, 1972

An estimated 5 million off-road recreational vehicles—motorcycles, minibikes, trail bikes, snowmobiles, dunebuggies, all-terrain vehicles, and others—are in use in the United States today, and their popularity continues to increase rapidly. The widespread use of such vehicles on the public lands—often for legitimate purposes but also in frequent conflict with wise land and resource management practices environmental values, and other types of recreational activity—has demonstrated the need for a unified Federal policy toward the use of such vehicles on the public lands.

Now, therefore, by virtue of the authority vested in me as President of the United States by the Constitution of the United States and in furtherance of the purpose and policy of the National Environmental Policy Act of 1969 (42 U.S.C. 4321), it is hereby ordered as follows:

section 1. purpose—It is the purpose of this order to establish policies and provide for procedures that will ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands.

section 2. definitions—As used in this order, the term:

(1) "public lands" means (A) all lands under the custody and control of the Secretary of the Interior and the Secretary of Agricul-

ture, except Indian lands, (B) lands under the custody and control of the Tennessee Valley Authority that are situated in western Kentucky and Tennessee and are designated as "Land Between the Lakes," and (C) lands under the custody and control of the Secretary of Defense;

(2) "respective agency head" means the Secretary of the Interior, the Secretary of Defense, the Secretary of Agriculture, and the Board of Directors of the Tennessee Valley Authority, with respect to public lands under the custody and control of each;

(3) "off-road vehicle" means any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland or other natural terrain; except that such term excludes (A) any registered motorboat (B) any military, fire, emergency, or law enforcement vehicle when used for emergency purposes, and (C) any vehicle whose use is expressly authorized by the respective agency head under a permit, lease, license, or contract; and

(4) "official use" means use by an employee, agent, or designated representative of the Federal Government or one of its contractors in the course of his employment, agency, or representation.

section 3. zones of use—(a) Each respective agency head shall develop and issue regulations and administrative instructions, within six months of the date of this order, to provide for administrative designation of the specific areas and trails on public lands on which the use of off-road vehicles may be permitted, and areas in which the use of off-road vehicles may not be permitted, and set a date by which such designation of all public lands shall be completed. Those regulations shall direct that the designation of such areas and trails will be based upon the protection of the resources of the public lands, promotion of the safety of all users of those lands, and minimization of conflicts among the various uses of those lands. The regulations shall further require that the designation of such areas and trails shall be in accordance with the following—

(1) Areas and trails shall be located to minimize damage to soil, watershed, vegetation, or other resources of the public lands.

(2) Areas and trails shall be located to minimize harassment of wildlife or significant disruption of wildlife habitats.

(3) Areas and trails shall be located to minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors.

(4) Areas and trails shall not be located in officially designated Wilderness Areas or Primitive Areas. Areas and trails shall be located in areas of the National Park system, Natural Areas, or National Wildlife Refuges and Game Ranges only if the respective agency head determines that off-road vehicle use in such locations will not adversely affect their natural, aesthetic, or scenic values.

(b) The respective agency head shall ensure adequate opportunity for public participation in the promulgation of such regulations and in the designation of areas and trails under this section.

(c) The limitations on off-road vehicle use imposed under this section shall not apply to official use.

section 4. operating conditions—Each respective agency head shall develop and publish, within one year of the date of this order, regulations prescribing operating conditions for off-road vehicles on the public lands. These regulations shall be directed at protecting resource values, preserving public health, safety, and welfare, and minimizing use conflicts.

section 5. public information—The respective agency head shall ensure that areas and trails where off-road vehicle use is permitted are well marked and shall provide for the publication and distribution of information, including maps, describing such areas and trails and explaining the conditions on vehicle use. He shall seek cooperation of relevant State agencies in the dissemination of this information.

section 6. enforcement—The respective agency head shall, where authorized by law, prescribe appropriate penalties for violation of regulations adopted pursuant to this order, and shall establish procedures for the enforcement of those regulations. To the extent permitted by law, he may enter into agreements with State or local governmental agencies for cooperative enforcement of laws and regulations relating to off-road vehicle use.

section 7. consultation—Before issuing the regulations or administrative instructions required by this order or designating areas or trails as required by this order and those regulations and administrative instructions, the Secretary of the Interior shall, as appropriate, consult with the Atomic Energy Commission.

section 8. monitoring of effects and review—(a) The respective agency head shall monitor the effects of the use of off-road vehicles on lands under their jurisdictions. On the basis of the information gathered, they shall from time to time amend or rescind designations of areas or other actions taken pursuant to this order as necessary to further the policy of this order.

(b) The Council on Environmental Quality shall maintain a continuing review of the implementation of this order.

RICHARD NIXON.

The White House
February 8, 1972

appendix k

advisory committees of the council on environmental quality

In addition to the Presidentially appointed Citizens' Advisory Committee on Environmental Quality, the Council has appointed three advisory committees: the Advisory Committee on Advanced Automotive Power Systems, the Legal Advisory Committee, and the Tax Policy Advisory Committee. As required by Executive Order 11007, the members, a brief description of their functions, and the dates of their meetings are listed below.

citizens' advisory committee on environmental quality

functions

Established by Executive Order 11472, May 29, 1969, the committee advises the President and the Council on Environmental Quality on all aspects of environmental quality and recommends actions by Federal, State, and local governments and by the private sector. The Council consults with the Committee pursuant to section 205 of the National Environmental Policy Act (42 U.S.C. § 4345).

Chairman

Laurance S. Rockefeller
Chairman
Rockefeller Brothers Fund
New York, N.Y.

Members

Colonel Frank Borman
Senior Vice President
Eastern Air Lines, Inc.
Miami, Fla.

Henry L. Diamond
Commissioner
New York State Department of Environmental Conservation
Albany, N.Y.

René Dubos
Rockefeller University
New York, N.Y.

Jean Fassler
Supervisor, San Mateo County
Redwood City, Calif.

Professor E. Corinne Galvin
Ithaca College
Ithaca, N.Y.

Arthur Godfrey
Arthur Godfrey Productions
New York, N.Y.

A. Wesley Hodge
Hodge, Dahlgren & Hillis
Seattle, Wash.

Charles A. Lindbergh

Governor Tom McCall
Salem, Oreg.

Jack B. Olson
Olson Boat Company
Wisconsin Dells, Wis.

Willard F. Rockwell, Jr.
Chairman
North American Rockwell Corporation
Pittsburgh, Pa.

Lelan F. Sillin, Jr.
President and Chairman
Northeast Utilities
Hartford, Conn.

Thaddeus F. Walkowicz
Rockefeller Family and Associates
New York, N.Y.

Mayor Pete Wilson
San Diego, Calif.

meetings

November 21, 1969, Washington, D.C.
February 13, 1970, Washington, D.C.
May 8, 1970, Washington, D.C.
August 31, 1970, San Francisco, Calif.
November 30, 1970, Washington, D.C.
March 19, 1971, Washington, D.C.
June 18, 1971, Washington, D.C.
September 30/October 1, 1971, Portland, Oreg.
January 14, 1972, Washington, D.C.
April 21, 1972, Washington, D.C.
July 21, 1972, Washington, D.C.

advisory committee on advanced automotive power systems

functions

The Committee advises the Council on research and development programs and other technical progress toward developing low-emission, surface-vehicle power systems as alternatives to the present internal combustion engine.

Chairman

Dr. David O. Ragone
Dean, Thayer School of Engineering
Dartmouth College
Hanover, N.H.

Members

James L. Dooley
Vice President, Engineering
McCulloch Corporation
Los Angeles, Calif.

Dr. S. William Gouse, Jr.
Associate Dean
Carnegie Mellon University
Pittsburgh, Pa.

Dr. George J. Huebner, Jr.
Director of Research, Product Planning and Development
Chrysler Corporation
Detroit, Mich.

Dr. Wolf H. Koch
Manager, Applied Electronics Department
Ford Motor Company
Dearborn, Mich.

Professor Robert F. Sawyer
Department of Mechanical Engineering
University of California
Berkeley, Calif.

Ernest Starkman
Vice President-Environmental Activities Staff
General Motors Corporation
Warren, Mich.

Dr. John H. Sununu
Associate Dean, College of Engineering
Tufts University
Medford, Mass.

Government Liaison Members

William B. Foote
Deputy Commissioner for Transportation
Transportation and Communications Service
General Services Administration
Washington, D.C.

Lewis Gerlach
Chief of Transportation Research
U.S. Postal Service
Washington, D.C.

Dr. Lawrence A. Goldmuntz
Technical Assistant to Director
Office of Science and Technology
Washington, D.C.

George D. Kittredge
Division of Emission Control Technology
Environmental Protection Agency
Ann Arbor, Mich.

Dr. James R. McNesby
Chief, Physical Chemistry Division
National Bureau of Standards
Washington, D.C.

Dr. Ernest N. Petrick
Chief Scientist
U.S. Army Tank-Automotive Command
Warren, Mich.

Joel Rosenblatt
Examiner, Natural Resources Programs Division
Office of Management and Budget
Washington, D.C.

Henry O. Slone
Assistant Division Chief, Space Power Systems Division
National Aeronautics and Space Administration
Cleveland, Ohio

Dr. Richard L. Strombotne
Department of Transportation
Washington, D.C.

Previous Members

Professor David O. Harris
University of California
Santa Barbara, Calif.

Professor Frederick J. Hooven
Department of Engineering
Dartmouth College
Hanover, N.H.

Dr. Craig Marks
Assistant Director, Advance Product Engineering
General Motors Corporation
Warren, Mich.

Professor William Mirsky
Department of Engineering
University of Michigan
Ann Arbor, Mich.

Previous Government Liaison Members

Dr. S. William Gouse, Jr.
Valentine Russack
Glenn Schleede
Dr. Louis Schoen

meetings

July 9–10, 1970, Ann Arbor, Mich.
October 7–8, 1970, Washington, D.C.

December 16–17, 1970, Santa Barbara, Calif.
March 23–24, 1971, Phoenix, Ariz.
July 19–20, 1971, Hanover, N.H.
October 21–22 1971, Warren, Mich.
February 3–4, 1972, Washington, D.C.
May 8–9, 1972, Boston, Mass.

legal advisory committee

functions

The Committee advises the Council on legal issues involved in environmental legislation, regulation, and litigation. It has studied the problems of public and private litigation, Federal enforcement of antipollution laws, international environmental law, and law student involvement in environmental programs.

Chairman

Whitney North Seymour, Jr.
U.S. Attorney for the Southern District of New York
New York, N.Y.

Members

Malcolm Baldwin
The Conservation Foundation
Washington, D.C.

William T. Coleman, Jr.
Dilworth, Paxson, Kalish, Levy and Coleman
Philadelphia, Pa.

Christopher DeMuth
University of Chicago Law School
Chicago, Ill.

Professor Frank P. Grad
Director, Legislative Drafting Research Fund
Columbia Law School
New York, N.Y.

Roger P. Hansen
Executive Director
Rocky Mountain Center on Environment
Denver, Colo.

Wesley A. Hodge
Hodge, Dahlgren & Hillis
Seattle, Wash.

Professor Louis L. Jaffe
Harvard Law School
Cambridge, Mass.

William F. Kennedy
Corporate Counsel
General Electric Company
New York, N.Y.

Professor Eugene Mooney
University of Kentucky Law School
Lexington, Ky.

E. Lewis Reid
Steinhart, Goldberg, Feigenbaum & Ladar
San Francisco, Calif.

Nicholas Robinson
Chambers of Judge Morris E. Lasker
New York, N.Y.

Professor Joseph L. Sax
University of Michigan Law School
Ann Arbor, Mich.

David Sive
Winer, Neuburger & Sive
New York, N.Y.

Professor Ann L. Strong
Director, Institute for Environmental Studies
University of Pennsylvania
Philadelphia, Pa.

meetings

May 25, 1970, Washington, D.C.
September 14, 1970, Washington, D.C.
January 11, 1971, Washington, D.C.
April 19, 1971, Washington, D.C.
October 18, 1971, Washington, D.C.

tax policy advisory committee

functions

The Committee advises the Council on the impact of the tax structure on the environment. In particular it has examined the question of whether existing tax policies are encouraging environmentally undesirable results and possible modifications of the tax structure to induce individuals and corporations to meet environmental goals.

Chairman

Dan Throop Smith
Lecturer,
Stanford School of Business
Stanford, Calif.

Members

Charles A. Anderson
President, Stanford Research Institute
Menlo Park, Calif. 94025

Eleanor Applewhite
Assistant General Attorney
Columbia Broadcasting Company
New York, N.Y.

Joel Barlow
Covington and Burling
Washington, D.C.

Dr. Rita Ricardo Campbell
Senior Fellow, Hoover Institution
Stanford University
Stanford, Calif.

Arnold Cantor
AFL-CIO
Washington, D.C.

Charles F. Conlon
Federation of Tax Administrators
Chicago, Ill.

John Dane
Choate, Hall & Stewart
Boston, Mass.

Kenneth W. Gemmill
Dechert, Price and Rhoads
Philadelphia, Pa.

Willis D. Gradison, Jr.
W. D. Gradison & Company
Former Mayor of Cincinnati
Cincinnati, Ohio

Professor C. Lowell Harriss
Department of Economics
Columbia University
New York, N.Y.

David A. Lindsay
Davis, Polk, Wardwell, Sunderland & Kiendl
New York, N.Y.

Dr. Joseph A. Pechman
Brookings Institution
Washington, D.C.

B. Kenneth Sanden
Price, Waterhouse & Company
New York, N.Y.

Leonard Silverstein
Silverstein and Mullens
Washington, D.C.

Richard Slitor
Department of the Treasury
Washington, D.C.

Dr. Jacob A. Stockfisch
McLean, Va.

Dr. Mabel Walker
Tax Institute of America, Inc.
Princeton, N.J.

Laurence N. Woodworth
Chief of Staff
Joint Committee on Internal Revenue Taxation
House of Representatives
Washington, D.C.

meetings

May 5, 1970, Washington, D.C.
May 28, 1970, Washington, D.C.
July 9, 1970, Washington, D.C.
July 29, 1970, Washington, D.C.
September 25, 1970, Washington, D.C.
January 20, 1971, Washington, D.C.
February 22, 1971, Washington, D.C.
November 30, 1971, Washington, D.C.
January 13, 1972, Washington, D.C.

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